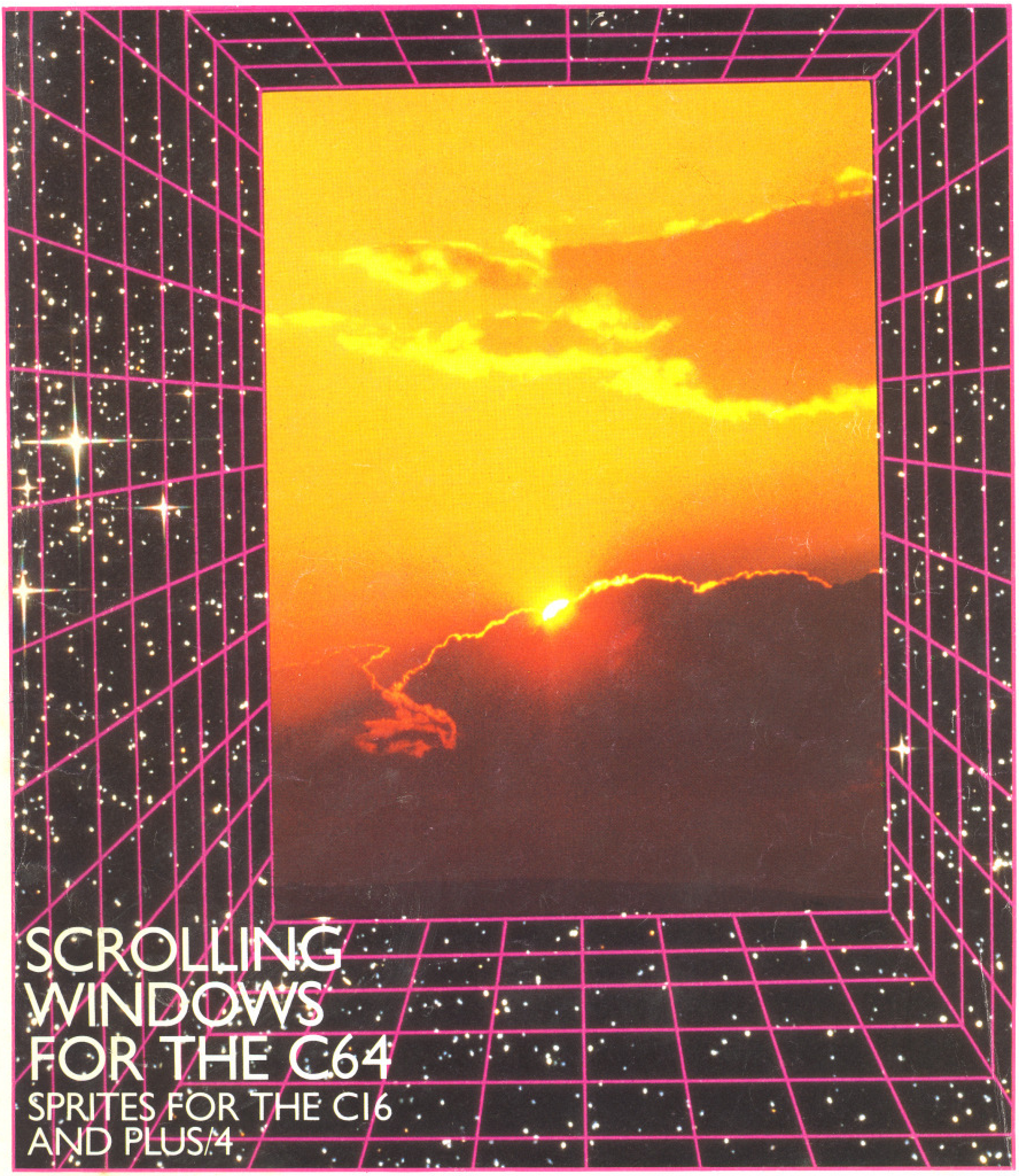
YOUR

COMMODORE

AN ARGUS SPECIALIST PUBLICATION

AUGUST 1987 £1.10



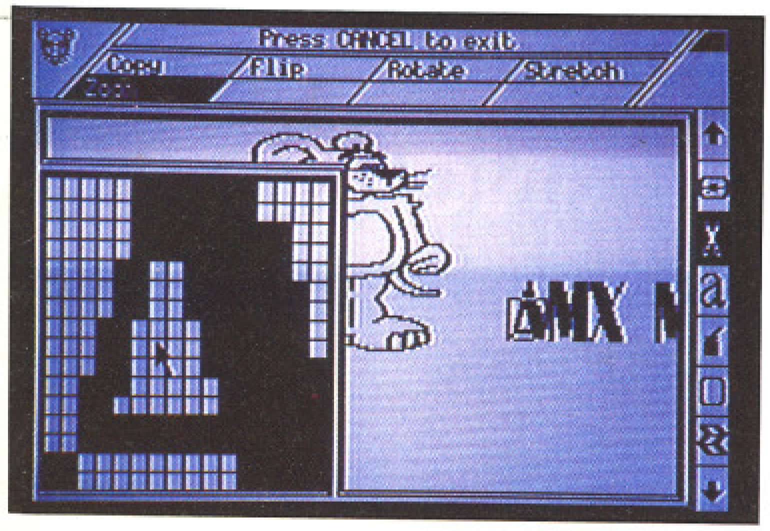
■ C64 MUSICAL PROGRAMMING ■ RS232 ON THE PLUS/4

■ SCREEN DESIGNER 64 ■ AMIGA 500 - THE FACTS

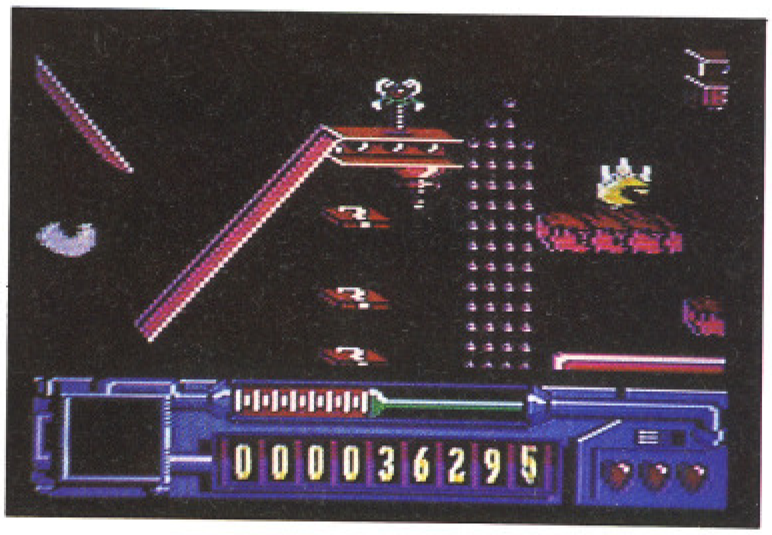
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REGULARS



UTILITIES

AUTO DUEL

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Drive aggressively and give way to no one.

AutoDuel is a fast-paced, strategy rôle playing adventure set in the year 2030. A time when the American highways are controlled by armed outlaws, and when danger lurks around every bend.

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THE JOINT VENTURE IN EUROPE

ORIGIN SYSTEMS INC.

MicroProse Software Ltd. 2 Market Place, Tetbury, Gloucestershire GL8 8DA. Tel: (0666) 54326. Tlx: 434222 MPS/UKG

DATA STATEMENTS

Arcade Scene

Imagine Software has released *Mag Max*, an arcade game for the C64, priced at £8.95 on cassette and £12.95 on disk.

The game is a conversion from a Nitchibutsu coin-op machine and features the creation of the robot Mag Max and his life-saving mission.

The game is set on a once civilised planet, now ravaged by the Mechanoids. Just before being annihilated, a team of scientists finishes the robot Max. However, the robot is split up with its body in a bunker and its vital components scattered around the planet. The player must collect all the pieces and retaliate against the enemy.

Starlight Software, the new label from Ariolasoft was recently launched with the release of three titles. The new games are *Greyfell*, *Dogfight 2187* and *Deathscape*. There are two others on the drawing board, *Red LED* and *Starfire*. All these releases are for the C64.

Martech is in the final stage of completing a new C64 title, *Mega-*



Apocalypse programmed by Simon Nichol (above) with graphics by Bob Stevenson and music by Rob Hubbard.

Martech is now looking for skilled shoot 'em up addicts to playtest the fast and furious new game. If your're interested you should write to Martech stating your scores in at least three of these classic shoot 'em ups: *Crazy Comets* (Martech), *Uridium* (Hewson), *Delta* (Thalamus) and *Dropzone* (US Gold).

If you come up to scratch you will be invited to a secret location to test the game and will get your name immortalised in the Galactic Hall of Fame.

Gremlin has released *Alien Evolution – the Story* set in the aftermath of a nuclear holocaust. The survivors are living in underground complexes and now after years of research have created an android, Cyborg 64, which should prove to be the answer to their prayers.

Cyborg 64 must attempt to clear the Earth of the strange aliens which have made their home on the planet's surface since it was abandoned by the human race. However, the problem is great since when an alien is destroyed a new breed arises from its remains.

Touchline

Ocean: *6 Central Street, Manchester M2 5NS* ***Tel:*** *061 832 6633.*
Martech: *Mega-Apocalypse, Martech House, Bay Terrace, Pevensey Bay, East Sussex BN24 6EE.* ***Tel:*** *0323 768456.*
Starlight: *68 Long Acre, London WC2E 9JH.* ***Tel: 01836 3411***
Gremlin: *Alpha House, 10 Carver Street, Sheffield S1 4FS.* ***Tel:*** *0742 753423.*

Amiga News

Triangle Television, the company which specialises in computer audio-visual systems, has opened a new sales department exclusively dealing with Commodore Amiga systems.

Triangle's Peter Barrett said: "Our new department offers a complete range of facilities including Amiga sales, and a full range of software with a 24 hour mail order facility. We also offer a comprehensive Amiga Training programme for Audio Visual and business users and we have an exciting research and development section which is working on a new range of devices to exploit the full potential of the Amiga in the AV and Video environment."

Precision Software has slashed the price of the powerful *Superbase Personal* by a third.

Superbase Personal was launched last autumn and since then 13,000 copies hae been sold. The new low cost version was available at the Commodore Show in June. Previously £149.95, the package now costs £99.95 including VAT.

SSI has plans for four new games for the Amiga.

The titles to look out for are *Kampfruge*, *Roadwar 200*, *Phantasie* and the new role-playing adventure, *Phantasie III – the Wrath of Nikademus*.

Touchline

Triangle: *130 Brookwood Road, London SW18 5DD.* ***Tel:*** *01 874 3418.*
Precision Software: *6 Park Terrace, Worcester Park, Surrey KT4 7JZ.* ***Tel:*** *01 330 7166.*
SSI: *US Gold, Units 2/3 Holford Way, Holford, Birmingham B6 7AX.* ***Tel:*** *021 356 3388.*

Budget Games

Firebird has recently launched two new games for Commodore owners. *Zolyx* is for the C64. The idea of the game is to fill 75 per cent of the screen by creating blocks of colour while avoiding fast moving white balls. The more screen you fill the more points you score but as you progress on to higher levels there are more white balls whizzing around to take a life away, and you only get four.

C16 owners will be delighted at finally getting their own version of the popular C64 title *Thrust*.

You are a dedicated member of the Resistance and are about to launch a big offensive against the Intergalactic Empire using captured starships. The problem is that the power supplies for the ships are still held in the Empire

DATA STATEMENTS

storage plant and you have to retrieve them.

Both these Firebird titles are on the Silver label and therefore are a mere £1.99.

Mastertronic also has two new releases, both for the C64.

Frenesis is a fast shoot 'em up with 40 levels in which you must use your lethal Startron to blast your way through hordes of aliens before they reach the cross. This title costs £1.99.

Voidrunner, the second C64 title from Mastertronic is £2.99. It is a Jeff Minter game in which you must blast away thousands of enemies whilst trying to learn up to 30 different types of ship formation.

Touchline
Firebird: *64 New Oxford Street, London WC1A 1PS.* ***Tel:*** *01 379 6755.*
Mastertronic: *8-10 Paul Street, London EC2A 4JH.* ***Tel:*** *01 377 6880.*

Adventure and Strategy

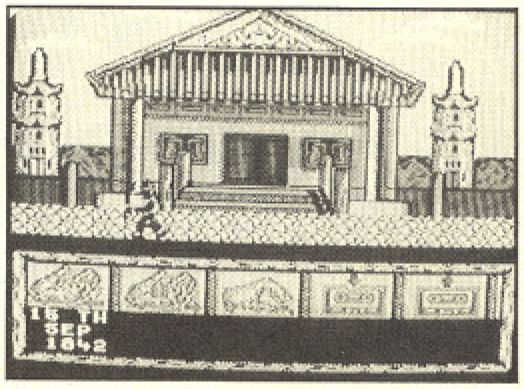
Virgin has released another game based on the interactive fiction books by Mark Smith and Jamie Thomson. The latest game in the series is *Falcon – The Reneagade Lord* and is the sequel to *The Way of the Tiger* and *Avenger*.

The player takes the role of Falcon, an agent of the Temporal Investigate and Monitoring Executive. The game is set in 3033 AD and there are eight different time zones to visit in order to collect important time artefacts. To complete the game the player must accomplish three missions.

Available on the C64/128, *Falcon* is out on cassette at £9.95.

Fans of the *Ket Trilogy* from Incentive can now get all three adventures on disk for only £9.95. The trilogy comprises three separate adventures: *Mountains of Ket, Temple of Vran* and *The Final Mission*.

Ocean has also released a game based on a popular book. *Tai-Pan* is set in the China of the 1840s and is based



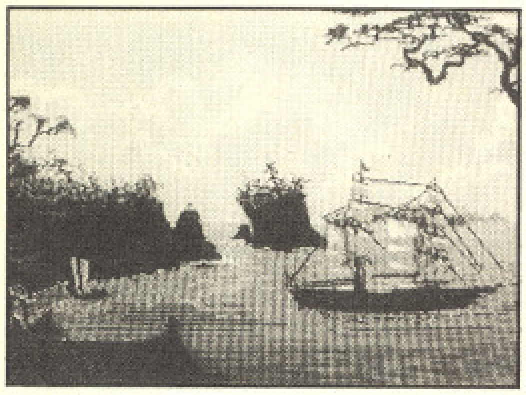
Screen shot from the Spectrum version of "Tai-Pan"

on the novel of the same name by James Clavell.

Assuming the role of Dirk Struan who starts life as a penniless trader, the player's objective is to become the Tai-Pan, a merchant prince of the Far East who accumulates riches beyond imagination.

Tai-Pan offers a variety of gameplay, either as a straight trading game, an arcade adventure or a shoot 'em up piracy operation.

It's available on Commodore cassette at £8.96 and disk at £12.95.



Screen shot from the Atari ST version of "Tai-Pan"

Touchline
Virgin Games: *2-4 Vernon Yard, Portobello Road, London W11 2DX.* ***Tel:*** *01 727 8070.*
Incentive: *2 Minerva House, Calleva Park, Aldermaston, Berks RG7 4QW.* ***Tel:*** *07356 77288.*
Ocean: *6 Central Street, Manchester M2 5NS.* ***Tel:*** *061 832 6633.*

Wargaming

Cascade games has released a Vietnam game based on the chart-topping Paul Hardcastle single of a couple of years ago, *Nineteen*.

The games features a 19 year old soldier who must either try and avoid the draft or go and fight in Vietnam. If you try and avoid the draft the game becomes a text graphic adventure featuring the activities of the Peace Corps. If on the other hand you decide to go and fight then you will be playing an arcade action game.

The game includes a soundtrack by Rob Hubbart and a coded version of the single.

PSS has released another wargames compilation, *Conflicts II*. The new bumper pack features three games in the Great Battles of the Pacific theme.

Conflicts II is for the C64 and the games included are: *Battle for Midway, Iwo Jima and Okinawa*. The last of these is a brand new title.

Activision has released a nuclear war game based on the American Star Wars defence policy. The player is in charge of the development and use of the SDI (Strategic Defence Initiative) system and their aim is to repel a Soviet nuclear attack. A comprehensive instruction booklet explains the principles behind Star Wars and details the type of weapons that such a system would have to deal with.

Written by Allen Steel, co-author of *Theatre Europe, High Frontier* is available for the C64 on cassette at £9.99 and disk at £14.99

Touchline
Cascade: *Harrogate, North Yorkshire* ***Tel:*** *0423 525325.*
PSS: *452 Stoney Stanton Road, Coventry CV6 5DG.* ***Tel:*** *0203 667556.*
Activision: *23 Pond Street, London NW3 2PN.* ***Tel:*** *01 431 1101.*

Tune Into Teletext

Microtext have announced the availability of their eagerly awaited tuner. A video is no longer required to receive Teletext like Cefax or Oracle on the Commodore 64/128.

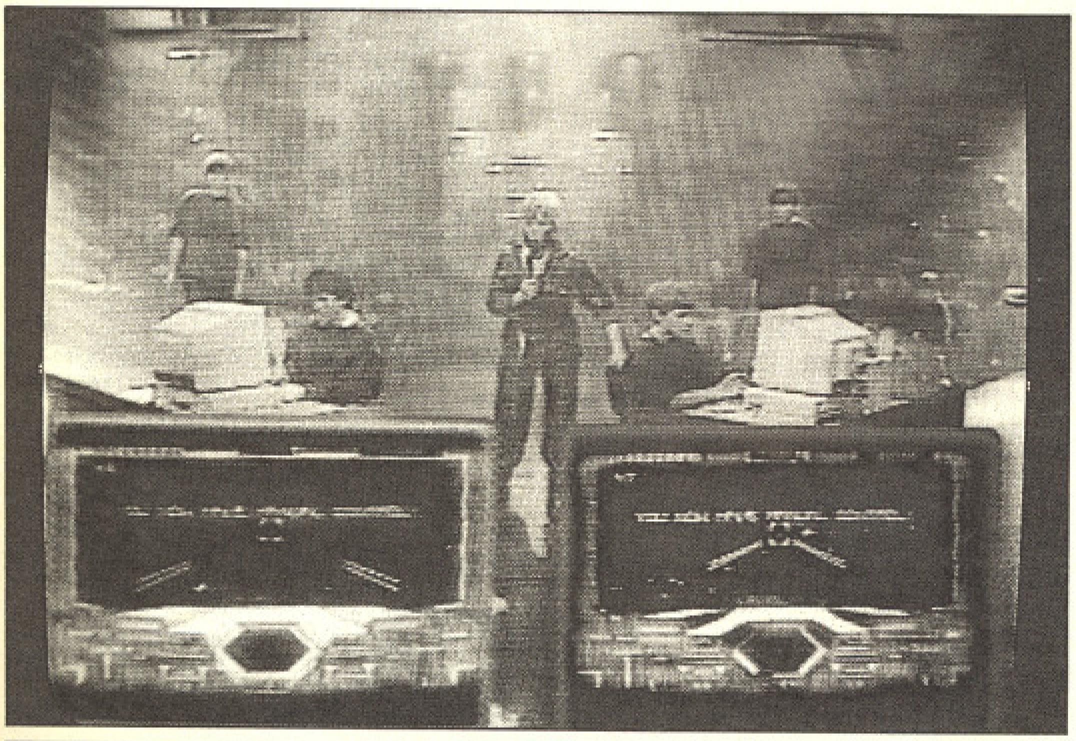
The Microtext tuner is now available for use in the UK and has been designed specially for use with the Microtext Teletext adaptor; it uses an advanced tuning system – no more fiddling with knobs as it tunes itself!

The system allows teletext pages to be saved to disk/cassette or printed out and advanced users can access teletext from their own programs, providing endless possibilities. The teletext services hundreds of pages of up-to-the-minute information absolutely free.

The complete system consists of a teletext adaptor, tuner, power supply, software on cassette (easily transferred to disk), connecting lead and a manual and costs £114.80 inc. p/p (plus £8.50 for 124d version).

Touchline

Microtext: *7 Birdclip Close, Hordean, Hampshire PO8 9PW.* ***Tel:*** *0705 595694.*



Get Lucky

The FA Cup Final at Wembley was a special occasion this year for Ian and Andrew Begg. They were the winners of the Addictive/Prism *Football Manager* competition. The prize was a day out with Kevin Toms, author of the game, at the FA Cup Final in which Coventry beat Tottenham Hotspur 3-2. Unfortunately, the Beggs are Spurs fans but they seem to have enjoyed their day despite the disappointing result.

Kevin Toms said: "Although Spurs have achieved great success in Andrew's living room, including the double, his first actual trip to Wembley didn't produce the scoreline he was looking for. I think, though, judging from the look on his face, that Andrew enjoyed just being at Wembley for real."

Meanwhile on the TV, Rainbird's *Starglider* has achieved national fame by being featured on Saturday morning's ITV childrens' program, *Get Fresh*. The game forms part of a competition called Get Lucky and there are three heats every morning in which *Starglider* is played for 50 seconds. The competition continues until the end of August when the winners will carry off a Commodore Amiga system for their school.

Touchline

Prism: *Unit 1, Baird Road, Enfield, Middx EN1 1SJ.* ***Tel:*** *01 804 8100.*

Rainbird: *Unit 1, Baird Road, Enfield, London W1A 1PS.* ***Tel:*** *01 240 8838.*

Communications

Comp-U-Card, the home computer shopping service, has announced a new online facility for Prestel members.

Now subscribers can dial up the Comp-U-Store at local telephone rates throughout the UK.

The service is part of a £1 million investment and as a further incentive, new members are being offered a three month free trial.

General manager, John Slater commented: "This additional service now offers our members faster, more direct access to our database of over 20,000 top name products, all guaranteed to be at the lowest available prices. From May 1 a subscriber in John O'Groats will be able to use the new system as economically as someone in our home town of Windsor.

Compunet has announced the launch of *Federation II*, its new multi-user space game. Commodore owners were first to give the game a try last month but owners of other computers only have to wait until the autumn. However owners of any micro can have a go in a limitied single user demo version.

Federation II is the biggest multi-user game ever written. It can handle up to 128 players at once and has up to 2500 locations, depending on the number of people playing.

Federation II is multi-layered, it has exploration, trading, fighting and strategy and can be played on any of these levels.

Touchline

Comp-U-Card: *1 Eton Court, Eton, Windsor, Berks SL4 6BY.* ***Tel:*** *0753 853553.*

Compunet: *7-11 Minerva Road, London NW10 6HJ.* ***Tel:*** *01 965 8866.*

Legal News

Software is once more making legal news with the setting up of the National Software Register.

Many people are confused about the law of copyright which is the only law currently in force which can protect the programmer's rights.

The NSR has been set up to establish evidence for programmer's when claiming copyright of a piece of software.

The law currently states that the moment a program is written then the copyright belongs to the author. The NSR will allow a programmer to gain a certificate of resistration as soon as he sends a copy of his program to the register. On receipt of a program in listed format together with a standard fee, the NSR will make a copy for security purposes, storing the original and the copy in different locations. The author will receive a Certificate of Registration and the contents of the program will not be revealed except by permission of the author.

The Data Protection Act has recently come into force and despite a lot of publicity in the computer and the national press, many people are still uncertain as to what it can mean for them. A series of free booklets has been published by the Data Protection Registrar's office and these can be obtained by calling the number in Touchline.

Touchline

The National Software Register: *235 Chase Side, Enfield, Middx EN2 ORA.* ***Tel:*** *01 367 9700.*

The Data Protection Registrar: *Springfield House, Water Lane, Wilmslow, Cheshire SK9 5AX.* ***Tel:*** *0625 535777.*

Technology and the Disabled

ICPUG, the Independent Commodore Products Users Group, has recently appointed a Disability Liaison Officer, David Bate, to its National Committee.

David's brief is to provide assistance and advice to disabled computer users. One of his key functions is to advice disabled users what aids and adaptions are available, where they may be purchased, and how to obtain assistance from the DHSS or other organisations to procure them. To accomplish this David needs information from manufacturers and retailers of this type of equipment as well as feedback from users of these items.

Even people with a severe physical disability can use computers quite extensively and not least for things such as word processing and communications. Sometimes special keyboards or other input devices are required but in many cases only small aids are required which can make routine tasks like changing floppy disks or feeding paper into a printer infinitely less frustrating.

If you (or your company) have items which may be of help to disabled computer users or if you have ever used any such devices please contact the ICPUG Disability Liaison Officer, Mr. David Bate. Literature and first hand user information are always needed and welcome, but actual samples of an aid or adaption are particularly useful as these may be evaluated in actual use. Any samples will be returned if requested.

This new ICPUG aims to help the disabled help themselves. Any and all assitance will be greatly appreciated. It may be of interest that David is himself disabled and so has first hand knowledge of the problems faced by users like himself.

Touchline

ICPUG Disability Liaison Officer: *David Bate, 71 Bedford Road, Bootle, Merseyside L20 7DN.*

New Face at Commodore

Commodore Business Machines (UK) Ltd have recently appointed Steve Franklin to the position of General Manager to the Maidenhead based home and business personal computer company.

For the past two and a half years, Steve has been with Granada Business Centres as sales and marketing director and prior to this was national sales manager for the advanced systems division of Ranx Xerox.

Steve has had extensive experience in selling a vast range of IBM and compatible business systems, networks and peripherals. Combined with business and marketing flair, this will help to push the company's further inroads into the business market place with the new Commodore Amiga A2000 and advanced PC series product ranges.

Touchline

Commodore Business Machines (UK)Ltd: *Commodore House, The Switchback, Gardner Road, Maidenhead, Berks SL6 7XA,* ***Tel:*** *0628 71456.*



Steve Franklin

I.Q.

If you hate shooting aliens and feel that you need something more intellectual to stimulate your grey matter then look over this selection of games.

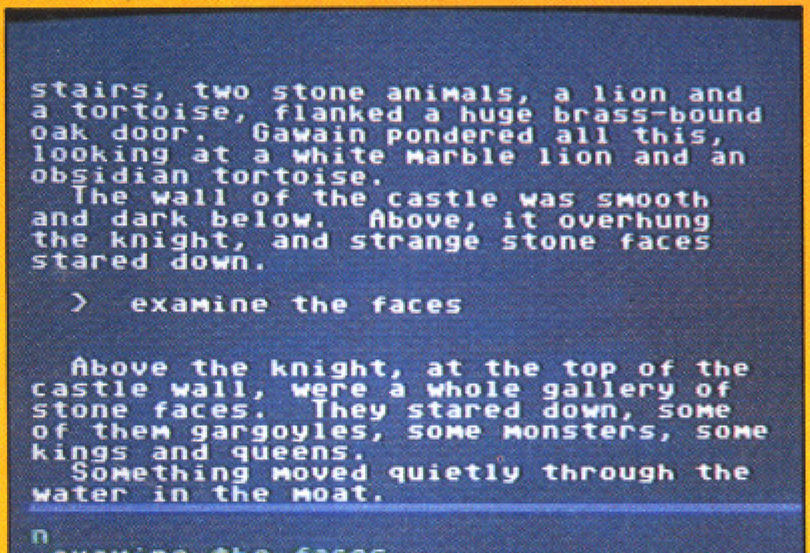
BRIMSTONE

As adventure games become ever more sophisticated, it seems that calling them adventures just isn't good enough any longer. Infocom call their games interactive fiction. Broderbund have just released the electronic novel - or rather three of them. So just what do these games have to offer that warrant them being called something different?

Well to start with, they are all disk-based. This means that the stories can be bigger and better than tape-only games but it should be noted that American companies don't go in for text compression like, say, Level 9. But there again, these games take up three or four sides of disk.

Then there's the packaging. This is one area where the Yanks leave the Brits standing. You are just itching to take the boxes off the shelves and have a look inside them. As a bonus, it also makes the games that much harder to pirate. Backing up the disks is easy - indeed, they even suggest that you do so but it is not worth your while running off an extra copy for your friend as she, or he, needs all the extra bits and pieces in order to play. In the case of Electronic Novels, you get a 100 page hardback book containing details of storyline, illustrations, space for maps and summaries of the game's commands.

The games themselves are superbly constructed. The





descriptions are both lengthy and atmospheric. Smells and sounds abound, things that no illustration can ever depict. The puzzles too are both original and logical and succeed in drawing you into the story. The games feature an excellent and sophisticated parser and other characters in the plot exhibit a fair degree of independence.

A thesis in Obtuse Triangular Philology is enough to bore the pants off anyone and Jeremy Diddler is no exception. So one day, leaving aside all medieval references

to Saint Slog, he inadvertently steals a manuscript all about Sir Gawain, one of King Arthur's Knights of the Round Table. Much more exciting although it does lead to Jeremy's arrest and imprisonment. However he has time to mail the game to a leading software company, exchanging all software rights for an attempt to release him.

The year is 1317, the date, All Hallows. Gawain i.e. you, is having trouble keeping his eyes open as Bedevere plucks at his lute. Quickly he drifts into a deep dream and awakes to find himself outside a castle. Getting in is no problem, but how does he get the magical suit of armour? He sees several people that he recognises, including Master Adam, his battle tutor, but there is something treacherous in the air and Gawain finds himself being tried by a court of demons.

Imprisoned in the same cell as a certain Jeremy Diddler, you manage to escape with the help of a bat-eared gargoyle. You are led to the entrance of the underworld with but twenty four hours to make good your escape. If you are to succeed, you must first overcome such problems as the Green Knight, the White Apes and Magician Blake.

Brimstone leads you through the story, chapter by chapter. Likewise, the problems get that little bit harder as you progress so that you can get well and truly involved in the game before you get really stuck. **G.R.H.**

Touchline

Title: *Brimstone* ***Machine:*** *C64 - disk only* ***Supplier:*** *Broderbund/US Gold, Units 2/3, Halford Way, B'Ham B6 7AX* ***Price:*** *£24.99.*

Originality: *9/10* ***Graphics:*** *N/A* ***Gameplay:*** *9/10* ***Value*** *9/10*

MINDWHEEL

The second electronic novel, Mindwheel, is a strange mixture of science fiction and fantasy. Civilisation in The Federated Nations is collapsing. Tourists are being ripped apart by packs of wild dogs. Rioting and looting in the streets is rife. A leak is discovered in a nerve gas stockpile. The apocalypse seems inevitable.

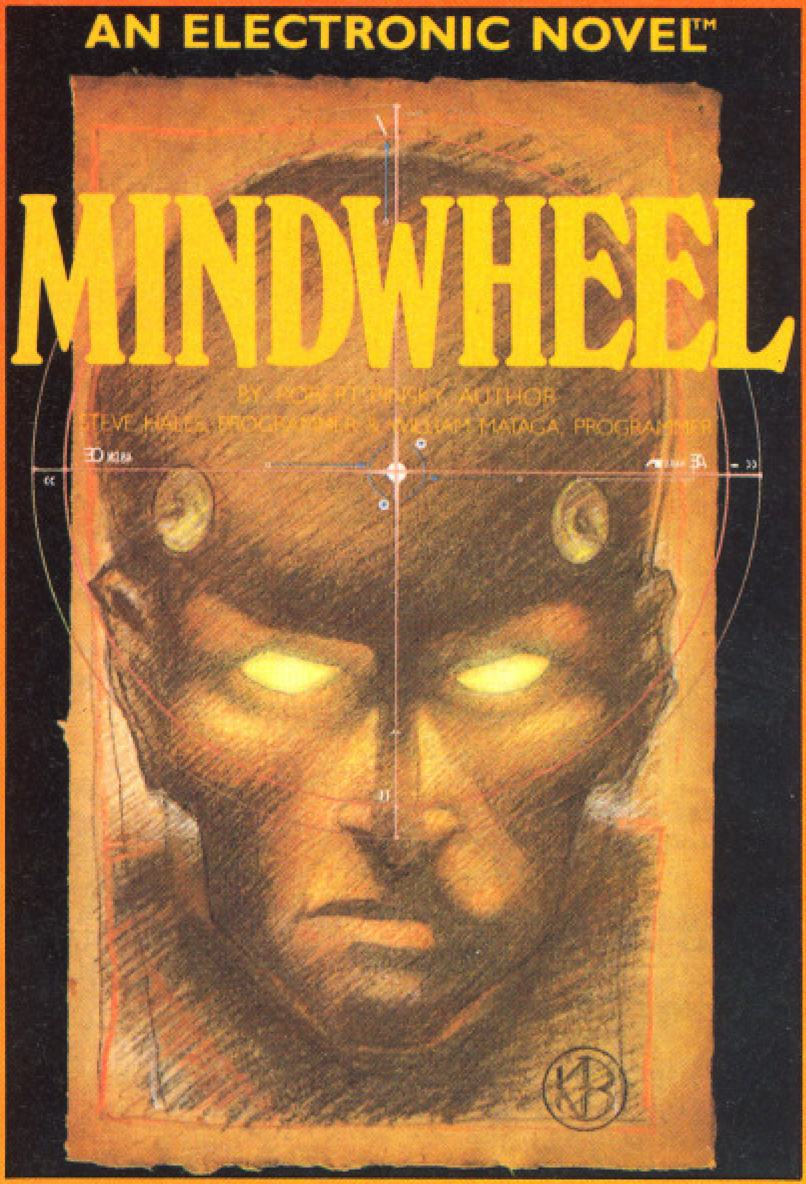
Only one man understands exactly what is going on. Doctor Virgil is looking for a volunteer to travel through time in order to retrieve the Wheel of Wisdom.

Doctor Virgil has been researching into neuro-matrix mind travel. By telepathically journeying through four different minds, you (for how could you fail to volunteer) can be transported to the Cave Master, owner of The Wheel, at the very Dawn of Time.

You remember the Doctor throwing a switch in his laboratory, but your next awareness is that of being in centre stage, accompanied by a backing group and in front of several thousand screaming fans. You are in the mind of Bobby Clemon, assassinated rock star. A huge video screen above your head is showing close-ups of your death. A fan tries to climb up on stage and reach you but is diverted by a bulky bodyguard.

Although you have never been aware of any musical talent in your previous existence, the crowd obviously expect you to sing and, to your surprise, you soon find yourself playing the keyboards with words pouring out of your mouth. Not your own words, mind, but you are convinced of their significance to your future journey.

Backstage, a woman urges you to follow her, and you do so, up a winding staircase. A winged woman in a cage blocks your path until you have successfully answered a riddle. Only then are you free to enter a castle that lies beyond.



The castle belongs to The Generalissimo, one of the most feared dictators of his time and the second of your four minds. Eventually executed for war crimes, his domain includes such problems as passing a guard, half of stone, half human, and answering yet another riddle. You go on to discover a tribe of animal-headed children.

There are yet two minds left for you to discover. A poet, composer of your culture's great epics and Dr Eva Fein, a sort of female Einstein who specialises in the matter of nature and was once a schoolmate of The Generalissimo... the plot of Mindwheel can best be summed up as weird, but the game is no less fascinating for that - even if I haven't got a clue what is going on. **G.R.H**

Touchline

Title: *Mindwheel* ***Machine:*** *C64 - disk only* ***Supplier*** *Broderbund/US Gold, Units 2/3 Halford Way, B'Ham B6 7AX.* ***Price:*** *£24.99.*

Originality: *10/10.* ***Graphics:*** *N/A.* ***Playability:*** *8/10.* ***Value:*** *8/10.*

BREAKERS

The third of this month's Electronic Novels is unashamed science fiction. The planet Borg, hidden in the deep recesses of the outer tentacles of the Slug Nebula, is the home of the Lau people. It is also a haven for evil.

Every sort of misfit, criminal and thug seems to gravitate towards Borg at some stage in their career. The planet is

supposed to be a centre of intergalactic slave trading but this tends to be a cover for other criminal activities. Corruption is rife. Everybody is out to look after number one. As a Breaker, you fit admirably into the background.

There is a general air of panic around the bar where you are quietly getting drunk. The constellation Garbo seems to be disappearing and tradition has it that when this happens, the planet will either be destroyed or saved. Are you interested or do you order another drink?



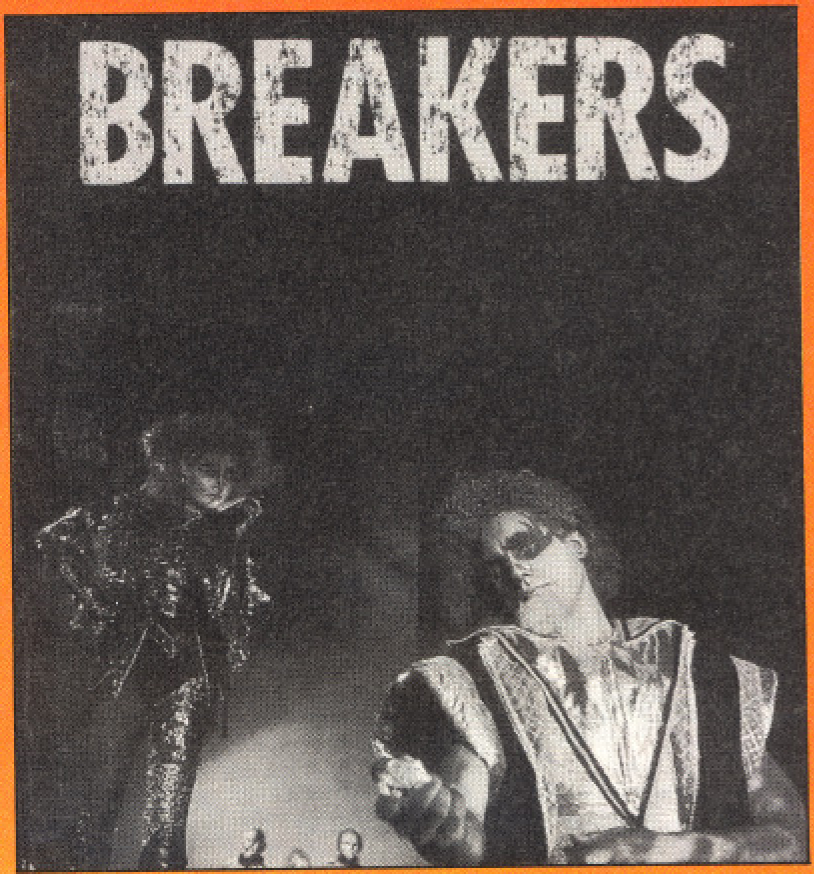
As there is not much of a game in the latter option, you immerse yourself in the role of hero yet again. The game begins with you trying to escape from the clutches of a Gak patrol that has just entered the bar. This is done with the aid of some friends although you are unsure as to how far you can trust them. You seek temporary refuge in the cellars below the inn.

Here you find a strange red ball that seems reluctant to be picked up. There is also a newspaper cutting that should prove useful to you later on when you practise the ignoble arts of torture and interrogation. You soon discover that you are being followed by Nate Grey, although you don't have a clue why. Of more immediate concern to you is how much gold it costs to persuade a Gak to look the other way for a few minutes.

All three games work well because they are proper stories not a collection of loosely associated problems. The atmosphere within the game is superbly built up and the only major criticism that I can come up with is one that can't be laid on Broderbund! Everything is accessed from disk and, with the 1541 not being exactly renowned for its speed, playing the game doesn't exactly flow very smoothly. That apart though, all three Electronic Novels are unreservedly recommended. **G.R.H**

Touchline

Title: *Breakers* ***Machine:*** *C64 - disk only* ***Supplier:*** *Broderbund/US Gold, Units 2/3, Halford Way, B'Ham B6 7AX* ***Price:*** *£24.99* ***Originality:*** *8/10* ***Graphics:*** *N/A* ***Playability:*** *8/10* ***Value:*** *8/10*



ELECTION

It was inevitable that all the hype surrounding the General Election would spawn a computer game spin-off. It was also inevitable that it would be awful.

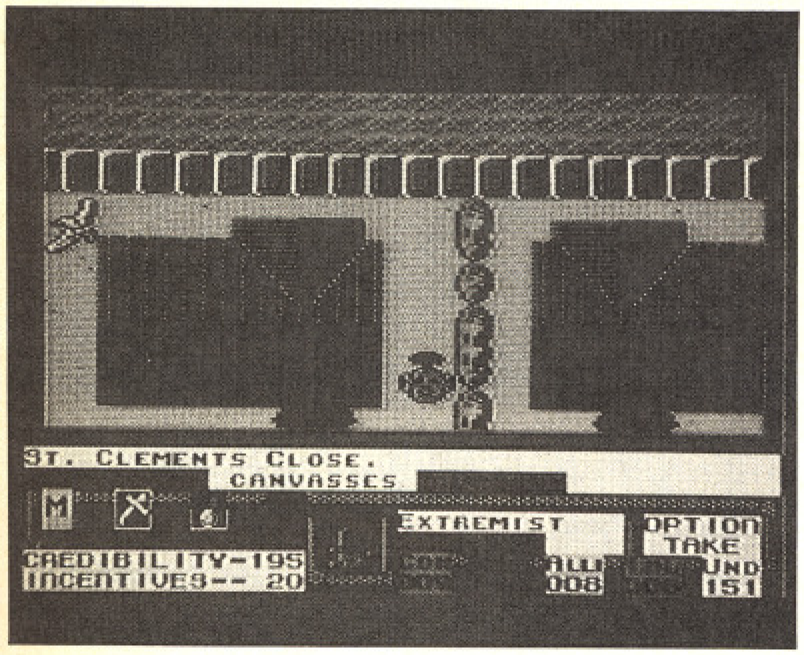
In this remarkably silly game you play either Matcher, Ninnock, Owing, Pig Iron or the leader of the Idealist Party Daniel Pauls. The object of the game is to move your party leader, or his head, anyways, around the game screens, representing districts of a town,in order to canvass for votes. You do this by asking for support or bribing with gifts or incentives (manifestoes, knighthoods, shares and gossip) in order to win 101 of the 199 votes available.

Once you've gained the support of one of the computer - controlled characters you can order them to either help you (i.e. follow you around), canvass another character on your behalf or slur another character or party leader. Slurring is essential if you're going to win the election as it weakens the target until they finally disappear leaving only a banana skin.

As the game proceeds you'll notice that even your own supporters will need canvassing to keep them in line, that 101 votes is almost impossible to get, you'll be bored silly before you collect 50votes- and the other party leaders come back even when they've been destroyed.

Maybe by the next Election someone somewhere will have written a decent Election game. T.H.

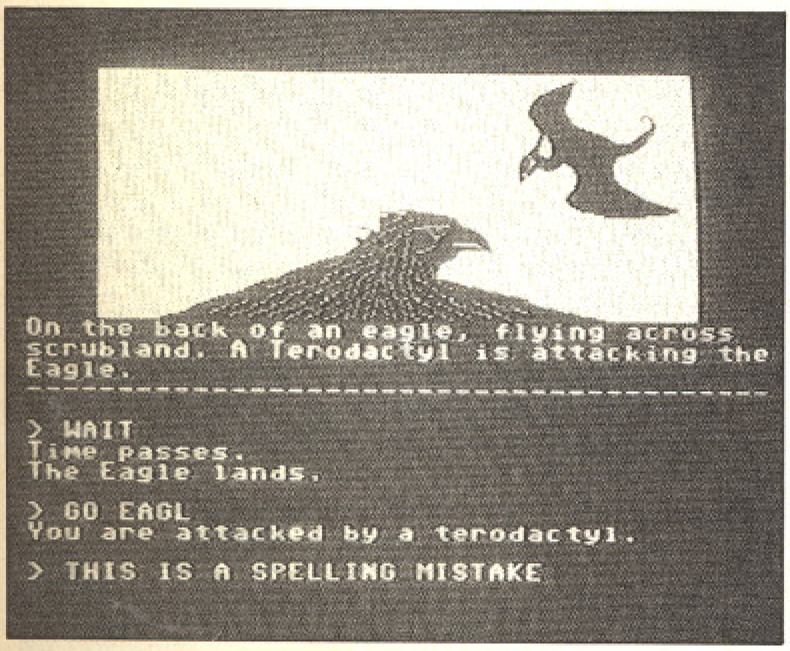
Touchline
Title: *Election.* ***Supplier:*** *Virgin, 2-4 Portobello Road, London W11 2DX.* ***Machine:*** *C64.* ***Price:*** *£9.95.*
Originality: *6/10.* ***Graphics:*** *5/10.* ***Playability:*** *6/10.* ***Value:*** *6/10.*



TEMPLE OF TERROR

The Fighting Fantasy books by Steve Jackson and Ian Livingstone are far and away the best-selling children's books in this country. It's therefore a natural progression to translate them to computer format.

The idea behind the books is that as you follow the story, you are often presented with a number of choices. Depending on your choice, you are referred to numbered paragraphs which in turn continue the story and lead to further choices. The action includes combat sequences which can be resolved by rolling dice.



Temple of Terror employs a fantasy setting in which you must search for five Dragon artefacts which have lain hidden for centuries in the lost city of Vatos. The reason for your quest to prevent the dark elf, Malbordus, finding the treasures first. It might complete his mastery of the dark arts...As is usual in this type of game, you are the only one foolhardy enough to volunteer.

Frankly the game is dreadful. Little or no atmostphere is created. The graphics are nothing special. The parser is crude by modern standards and there are several spelling mistakes which give the whole thing an amateurish feel.

What is worse is that US Gold expect you to fork out nearly ten quid for the game. Fine if it were worth it but object to paying even a budget price for this. Incidentally this is no reflection on Jackson and Livingstone. The books are excellent value for money. Go and buy a few of them instead.

G.R.H.

Touchline
Title: *Temple of Terror* ***Machine:*** *C64*
Supplier: *US Gold, Units 2/3, Halford Way, B'Ham B6 7AX* ***Price:*** *£9.99*
Originality: *4/10.* ***Graphics:*** *7/10.* ***Playability:*** *4/10.* ***Value:*** *1/10.*

THE SHADOWS OF MORDOR

If you think hobbits are habit-forming and you have nightmares about orcs, balrogs and ring wraithes then you'll have already solved The Hobbit and the first part of Lord of the Rings. The Shadows of Mordor continues this epic tale in part two of the three game series.

As in part one you control hairy hobbit heroes Sam and Frodo as they continue their quest to destroy the ring of power that controls and enslaves all others. As the game begins Frodo and Sam have left their companions on an island in the middle of a lake and have secretly gone on alone to continue their quest. Their objective is to cross the desolate wastelands and survive the trek through the evil mountains that surround Sauron's homeland.

The Shadows of Mordor is a traditional adventure with a vocabulary of over 800 words. Unlike the first game and, indeed, The Hobbit, this game is mainly text with only a few crude graphic screens to illustrate Tolkein's Middle Earth. Consequently it relies heavily on its text descriptions and improved interaction with the other characters. Now you can give Sam a whole string of commands instead of entering them one at a time. Whether he carries them out or not is another matter and depends on his state of health and hunger. Similarly, you could take the role of Sam and order Frodo instead or if you're feeling brave you could control both directly and swap between them using the Become... command. Obviously, this adds dramatically to your problems and so its best to allow the computer to take one or the other until you know your way around.

The game is supplied in a massive box containing the second book in the series that may provide some useful tips and, of course a map of the area. The game does differ from the book, but only to provide a better game rather than an Adrian Mole style multiple-choice story.

Unlike the first game that lacked dynamism because of the book's plot the action really hots up as the end of the quest is at last in sight (although you'll have to wait until part three to have at last the chance to destroy The Ring in the Crack of Doom).

If you've played Lord of the Rings then you'll notice that the emphasis of this game is towards adventuring, which should please Tolkien fans. Perhaps the last part of Lord of the Rings will be text only?

T.H.

Touchline

Title: *The Shadow of Mordor.* ***Supplier:*** *Mastertronic/ Melbourne House, 8-10 Paul Street, London WC2F 9JH* ***Machine:*** *C64* ***Price*** *£12.99 - Disk £9.99 - Cassette* ***Originality:*** *6/10.* ***Playability:*** *7/10.* ***Graphics:*** *4/10.* ***Value:*** *7/10.*

BUREAUCRACY

What could possibly go wrong? You've just landed a great job at the Happitec corporation, moved to a new town, and are about to leave on a two week trip to Paris which is being paid for by your new employer. What *could* go wrong? Everything! Your bank refuses to accept your change of address form and won't send you another one, Happitec has sent your tickets to your old address where the new owner has just discovered the dry rot and has decided to forward your post to the bank instead and you have to be at the airport this afternoon! This could only happen in a Douglas Adams story that just happens to be part of an Infocom adventure called Bureaucracy.

This dynamic combination has already produced the adventure version of the Hitchhikers Guide to the Galaxy. This time you must battle through a sea of red tape.

The game disk is accompanied by the usual high quality Infocom packaging that includes a letter from Happitec, the first issue of Popular magazine and an application form for the Beezer credit card. This form is an example of the fictitous but all-too-familiar Douglas Adams bureaucracy that you'll have to face in the game as it consists of an original and two carbon copies which have different questions and, more important, conditions of use. For example, on the original you agree to pay any charges against your account, but on the copies you agree not to use the card to buy anything and to let Beezer sign your name for anything anywhere leaving you to pay the bill!

Unfortunately, you can't start playing the game until you've filled in another on-screen registration form that prompts you for answers such as your name, address, girlfriend's name, job before the last one and previous girlfriend. This information is then used to 'personalise' the game and also clutter up your answer phone with messages to send your blood pressure soaring. If your blood pressure gets too high then you lose the game as you blow your top. However, that's going to be easier than solving the game and dealing with unwanted salesmen, bank tellers that direct you to closed counters, people who are never in although you can hear them when you phone, a fascist parrot, an old lady with a shotgun and a waitress in a restaurant who takes your order (burger, what type?, fries or jacket potatoes, salad, which dressing etc. etc.) then goes off duty leaving you to repeat the order – only to be brought the exact opposite.

This may sound annoying - and it is - but it's also incredibly funny and a challenging sequel to the legendary HitchHikers Guide. Unfortunately, as if part of the plot, the game is only available on machines supporting 128K so C64 owners can't play it. Now you've got no excuse not to get an Amiga or a C128. If that fails find a friend with one, they'll need the help!

T.H.

Touchline

Title: *Bureaucracy.* ***Supplier:*** *Infocom (Activision)* ***Machine:*** *C128.* ***Price:*** *£34.99*

Originality: *10/10.* ***Graphics:*** *N/A.* ***Playability:*** *9/10.* ***Value:*** *8/10.*

CARMEN SANDIEGO



Here's your chance to do a bit of detective work and brush up on geography at the same time . Carmen Sandiego is the leader of a gang of art thieves, international terrorists and general ne'er-do-wells.

Your mission starts with a telex from Interpol giving details of a nationally important art treasure that has just been lifted. Immediately jetting off to the scene of the crime, you find that there are three possible places to investigate. These will give you clues as to the next stop on the thief's itinerary. Each investigation takes time though and you only have until the end of the week to catch up with your suspect. When you think that you know where her or she has flown to, you can go and catch a plane. Remember that plane journeys and sleeping also eat away at your available hours.

As well as following your suspect, you also have to make a positive identification and get the necessary arrest warrant issued. As you investigate, you will pick up clues as to the personal habits of your adversary and these can be fed into the Interpol computer. For example, you may find that there are two men who have tattoos and black hair - but only one of them plays croquet.

The clues range from the simple to the impossible - but help is at hand. Accompanying the package is a World Almanac - nearly 1000 pages of closely packed information and it is from here that you are supposed to find out your answers. For example, which nation has stamps as its major export or even where Kigali or Moroni are. Your clues include currency, flags, industries, provinces and famous landmarks.

When you catch up with a thief, assuming you have a warrant, the criminal is arrested and your record updated. Solve enough cases and you earn promotion. The game is slickly presented - all menu-driven with some nice cartoon graphics. My only real grumble is that extracting the information from the Yearbook is not particularly easy. Perhaps a database on disk could have been included instead. Even so, the format works well and should appeal to anyone revising for O-Level geography. Perhaps Broderbund may like to consider a 'Where in Britain...' version.

G.R.H.

Touchline

Title: *Where in the World is Carmen Sandiego* ***Machine:*** *C64, disk only.* ***Supplier:*** *Broderbund/US Gold, Units 2/3, Halford Way, B'Ham B6 7AX.* ***Price:*** *£29.99*

Originality: *8/10* ***Graphics:*** *7/10* ***Playability:*** *8/10* ***Value:*** *8/10*

Facing Up To Printers

If you're bored with Commodore's own product, a printer interface may be what you need. We look at one of the options.

By Eric Doyle

Gee whiz! I wish I could afford a printer but the thought of an extra £80 or more for an interface really puts me off. Although Supra's G-Wiz is not dirt cheap it certainly saves on what you could be paying. After all what's £30 on the cost of a printer?

Any serious computer user will always reach a point where they wish they had access to a printer. For many this means dashing out to buy one of the Commodore range of machines as soon as funds permit. A Commodore printer is like a Chinese meal, you soon wish you had settled for something more filling and once again you wish you had a printer!

The answer is not to dash out to the shops but to sit and think for a while. Before long you realise that there are better printers on the market but how can they be hooked up to the C64? Nearly all of the possible candidates are parallel printers but the C64 only supports serial connection. The answer to this problem involves more expense: buy a serial/parallel interface.

The thought of more codes and switches could strike fear into the heart of the bravest programmer but the interface is probably one of the most user friendly add-ons available. G-Wiz is certainly that.

Open the Box

The G-Wiz interface is a box measuring 145mm x 90mm x 25mm. Three cables from the main unit terminate in suitable connectors for the printer, the serial port on the C64 and a cassette port connector which taps off a power supply for the interface. Don't worry the power connector still allows you to plug the cassette recorder in.

There are two basic modes for accessing your printer through this device. First and most fearsome is the transparent mode. In this case you can use the printer as a normal printer for use with software which has all of the necessary conversion software built in. It is also necessary for the correct operation of some advanced graphics modes which certain printers possess.

The second and more usual mode is 1525 emulation. This is an example of a double bluff. The C64 thinks it is talking to a Commodore VIC 1525 printer and the printer thinks it is listening to any old computer. The unit's in-built emulator translates the Commodore ASCII characters into Standard ASCII and the normal file opening and commands which are only addressable to a 1525 may be used. More than this, the special codes for specific printer features such as italic, condensed, underline and super/subscript modes can still be sent.

The unit is designed to give compatibility with a wide range of printers: Star, Epson, Okidata, Smith Corona Fastext 80, Pro-Writer, NEC, Panasonic amongst others. The problem with such a selection is that the interface has to be that much more versatile. Some printers need line feeds, other have them built in, you may want the printer as Device 4 or you may prefer Device 5. To combat this there is a bank of eight switches on the rear of the interface. A checklist of printers and corresponding switch settings is given on the unit itself as well as in the comprehensive 90 page manual.

Peculiar Commands

Another advantage of the G-Wiz is its ability to convert the peculiar commands in PRINT statements into recognisable codes when printing out listings. For example, instead of a reversed heart for clearing the screen the listing would show the following: [CLR]. In this way the interface solves a lot of the problems inherent with the standard Commodore printer's method of displaying listings.

The best test of an interface is whether you realise it's there or not. In tests I found that I could forget about the printer most of the time but the one time it needed attention I was glad of it! When using the Superscript word processor I was able to send the command 'LOCK' which means that the interface is effectively switched to transparent mode. This means that I can tell the program that I'm using a particular printer and use all of the facilities to produce a professional look to my documents.

The only problem with locking up the unit is that it can only be unlocked by unplugging the cassette interface and then plugging it back in. If the computer is powered up at the time, clumsy hands could cause a short and damage the computer. I would suggest that the first thing to do is to fit an on/off switch on the power supply cable to overcome this danger.

G-Wiz is a superb unit which does all that I need, the manual is not only clear but also includes hints and tips which I have not found anywhere else. At such a reasonable price it should prove a good investment for your current printer, and any you may upgrade to in the future. YC

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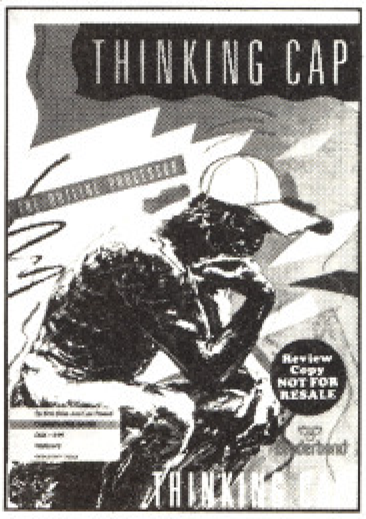
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Once the model is customized, it's time to print the precision parts and mount them on the special adhesive cardstock included in the package. Then you simply cut out and assemble the model. The Toy Shop includes everything you need: wire, wooden dowels, rubber stripping and balloons, and there's no limit to the number of each toy you can make! Every toy does something – from telling the time to floating on the head of a pin!

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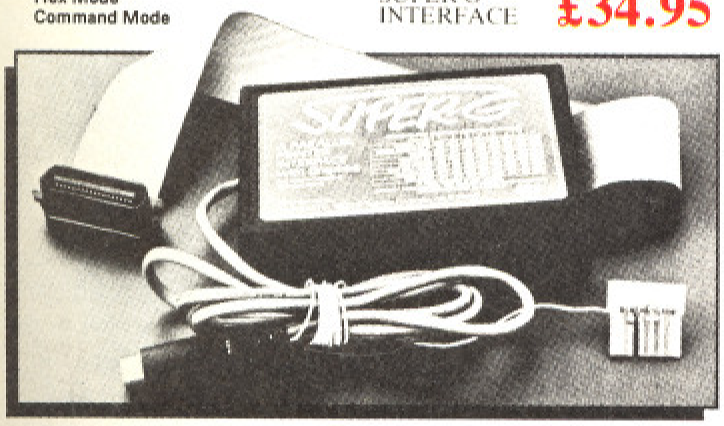
SUPER-G

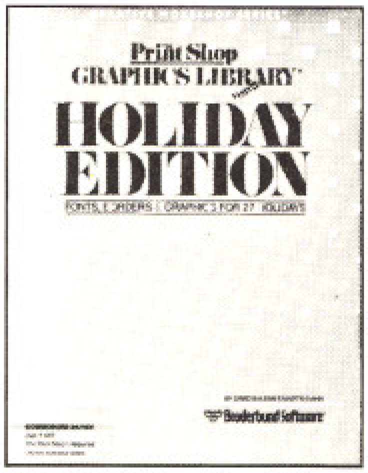
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- Plugs onto Serial Bus
- True 100% Compatibility with a Wide Selection of Printers
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  - Transparent Mode
  - Hex Mode
  - Command Mode

The Super-G is a high-speed centronics parallel printer interface for Commodore computers. It features the ability to print the full Commodore character set, including all graphics, reversed text, and reversed graphics characters. Its built-in buffer allows it to print screen graphics faster than most other Commodore interfaces available today.

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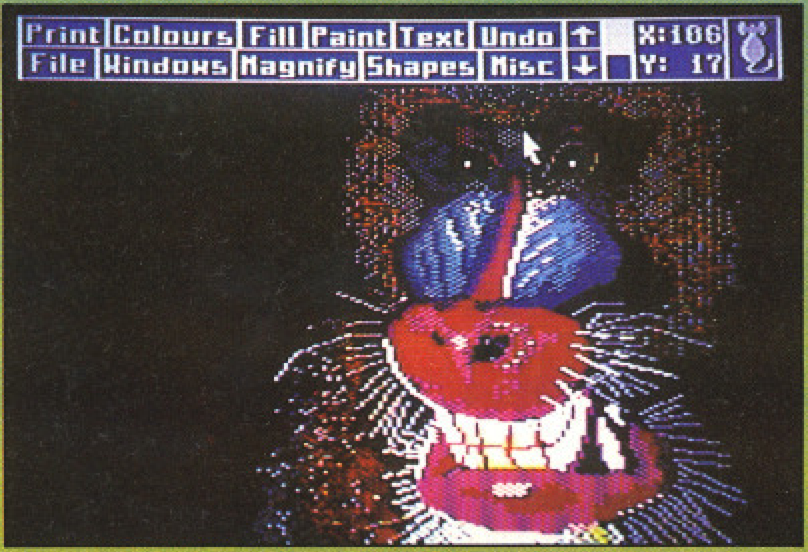
Address

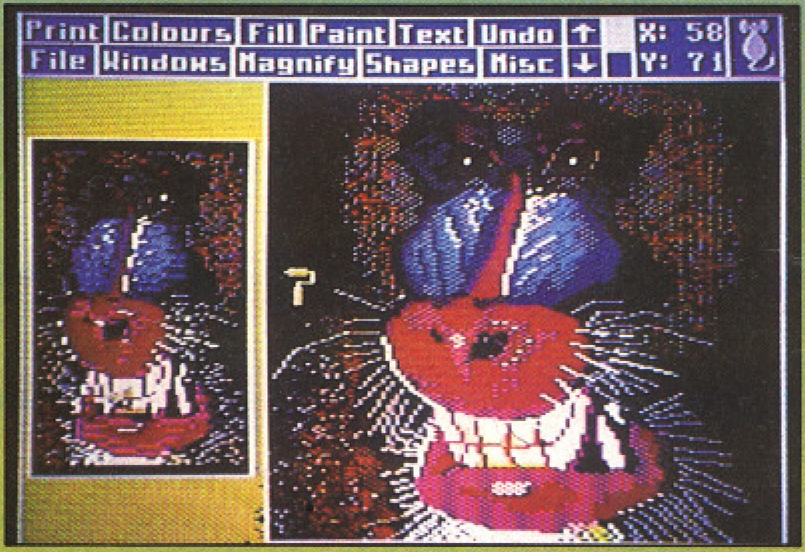
Post Code

The Advanced Art Studio

We look at the latest in computer art for the masses.

By Tony Hetherington





There is a vast horde of C64 graphics packages and hardware add-ons. One of the best is Rainbird's recent Art Studio. This has now been extended to form the Advanced Art Studio and sold with the original in the same pack with two manuals and two tapes or disks.

The original Art Studio is an easy-to-use, pull-down menu driven package that allows you to draw shapes, select colours, define and alter windows and paint in a variety of user-definable brushes without taking your eyes off your creation.

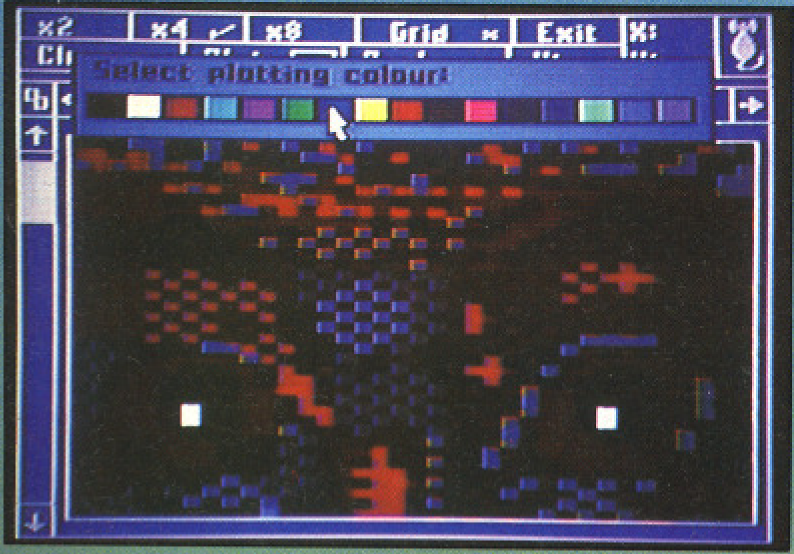
Each option is accessed through a series of pull-down menus that are listed in a bar that occupies the top two lines of the screen (these lines can still be used as the screen can be scrolled down to reveal them).

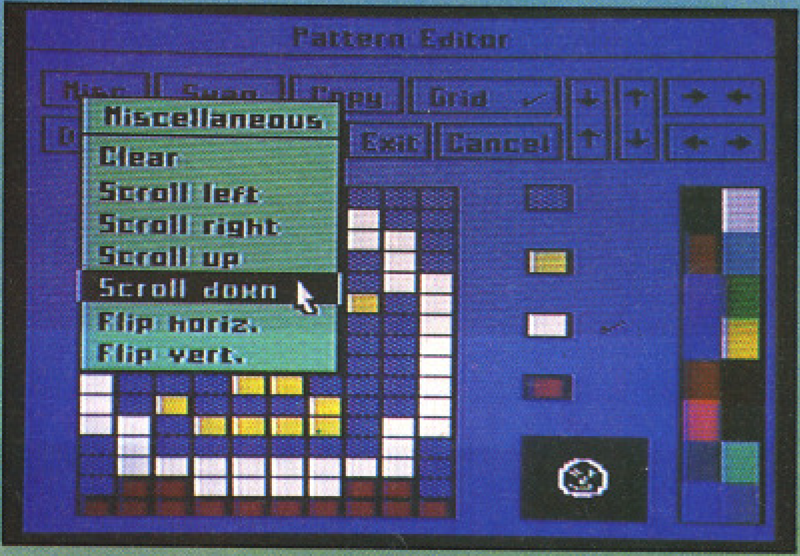
From the Shapes menu you can select for individual points, straight lines, rectangles, triangles, circles and rays. The position and size of the shape is displayed before you commit it to screen. These shapes can then be magnified 2,4 or 8 times to add fine detail, filled with colour and mixed with nine different text sizes that can be custom designed with a font editor.

Although the Art Studio is fast and easy to use it does have its limitations with the main one being the use of colour. Although graphics can be drawn in high-resolution mode, pixel by pixel, colour can only be applied in attribute areas one character in size. It 'smudges' badly if two different ink colours are too close together. The results are highly detailed but bland. The Advanced Art Studio sets out to put this right by operating in multi-colour mode in which up to three ink colours can share a 4 x 8 colour cell with a standard background colour.

Colours for inks are selected from the colour menu that can also be used to establish priorities should the three ink colour limit be exceeded. Then the top three colours in the priority list are displayed. You can also list colours in a second list that should be excluded from operations such as paint or clear. For example, if you draw a rough sketch in white and then mess up the rest of the drawing you could exclude white, then clear a window (that could be set to the full screen), and restore your original white outline.

As in the original Art Studio you can define the patterns that can form the Studio's brush but with a lot more scope. In the Advanced Art Studio the brush can be as large as 12 x 16 pixels and contain three ink colours. These can then be used as a normal brush and modified by the exclusion command that can take out one or more colours and so





change the pattern. Of course, the same is also true of fill patterns that can be used to create a crowd scene from a single pattern in under a minute!

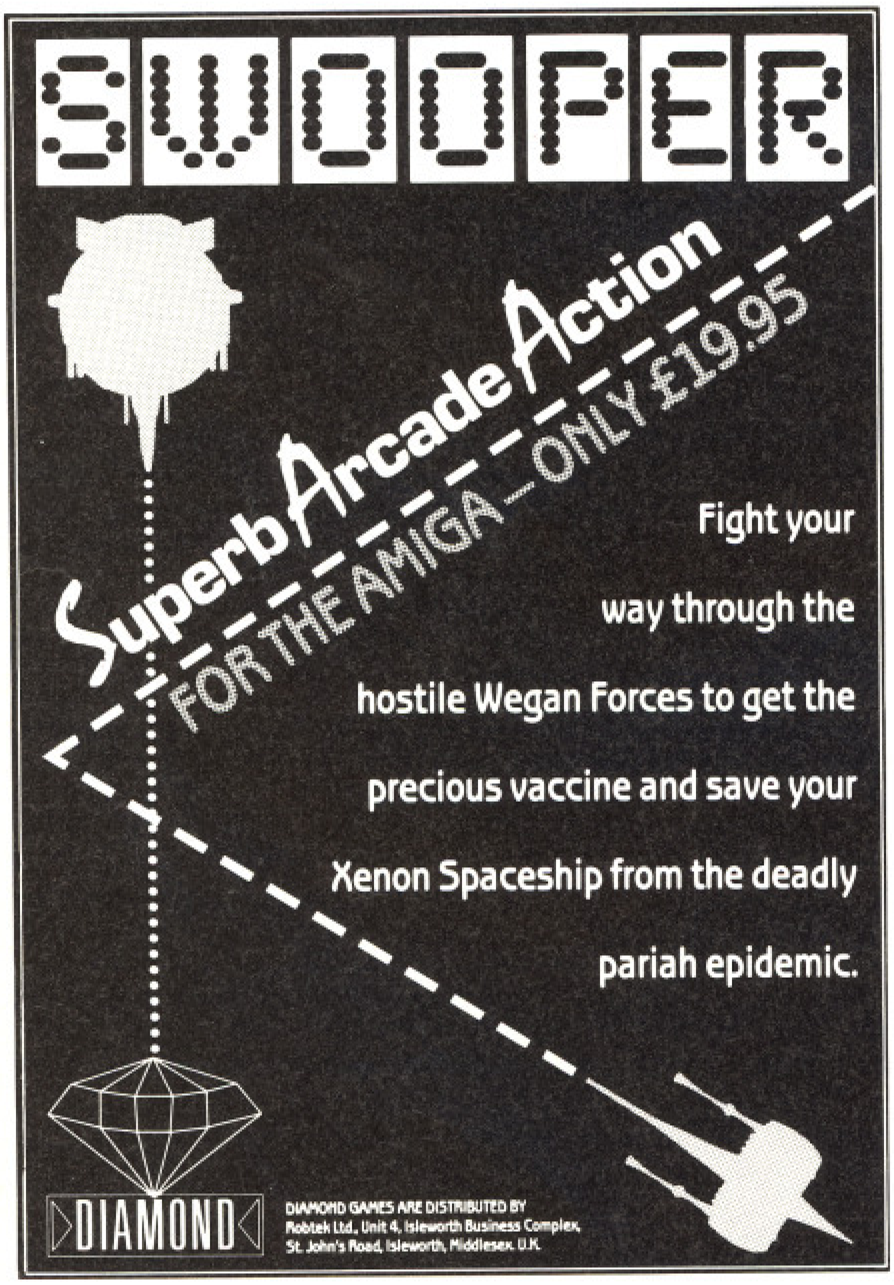
Once you've created your elements using brushes or shapes you can define them as a window and then save them to tape and disk to form a picture library. This can be used later to produce pictures from ready made clip art.

Other minor changes include the facility to change the fill and pattern cursors to represent what they will do to your screen. You can also print text right to left and upwards as well as left to right and downwards. Unfortunately, not all the changes are for the best. Text can be written on the screen in different sizes by changing the x and y ratios. However, the original Art Studio offered single, double and treble height and width characters so in fact there's no difference except that standard character set is now too big. Luckily, there's still a font editor so you can edit it back to the size it was before it was 'improved'.

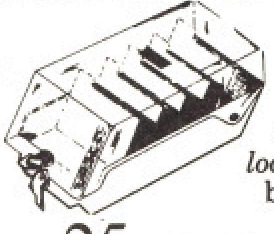
Both versions of the Art Studio are quick and simple to use, can be customised to your own needs and represent excellent value under £25 for both.

TOUCHLINE

Title: *Advanced OCP Art Studio.* ***Price:*** *£24.95.* ***Supplier:*** *Rainbird.* ***Tel:*** *01-240 8838.*



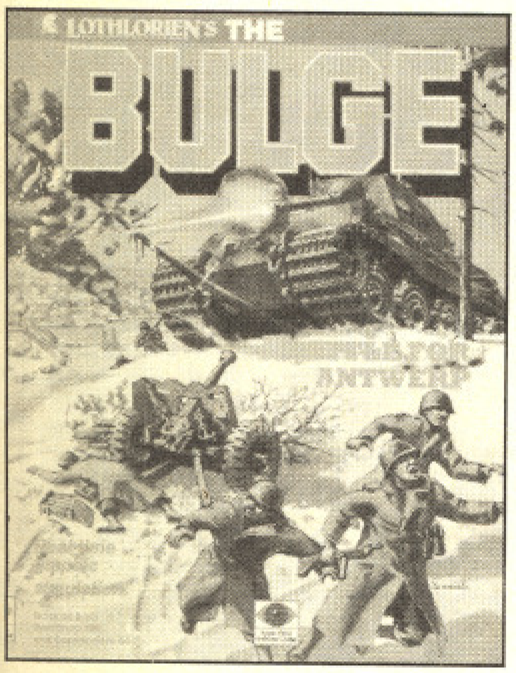
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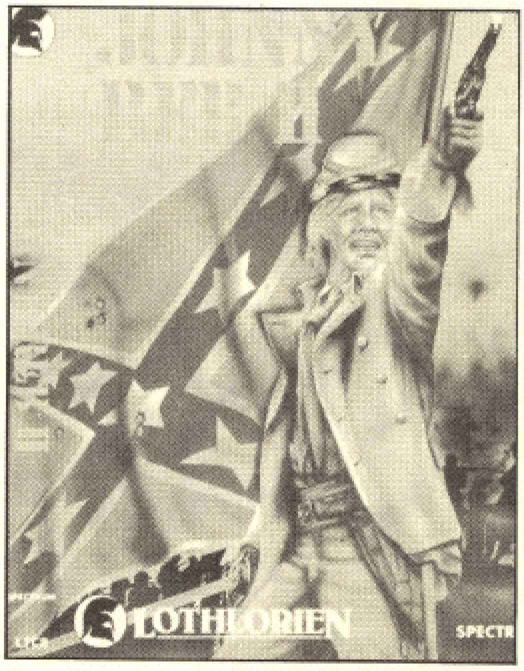


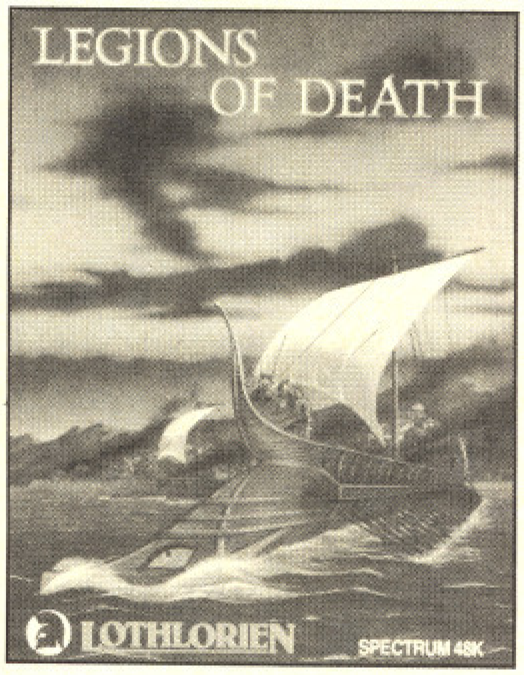


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This month we're offering readers of Your Commodore the chance to purchase three of Argus Press Software's top selling war games for just £12.95.

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The first game in the package is the popular *Legions of Death.* This is a historical simulation of the Punic wars in the period 264BC to 146BC. You take on the role of the Carthaginians battling away with the Romans. The battles are for the control of the Med and most of this simulation is centered on fighting at sea.

The game is icon driven making it a great game for both old and new war-gaming hands.

Battle of the Bulge is the second package on offer. This strategy game is based around this famous World War II battle. Options exist to allow you to play against either the computer or another human opponent.

Bringing up the rear of this excellent offer is the game *Johny Reb II.* This is the follow up to *Johny Reb* and is an icon driven simulation of the American Civil War. The action takes place around an important bridge and offers one or two player options with a choice of three playing levels.

These three games are only available at this knock down price by completing the form on this page and sending it with a cheque or postal order for £12.95 (including p&p) made payable to Argus Press Software.

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Please Note
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Diskit 6

This disk special will enable you to speed up the rate at which you can copy files from disk to disk.

By Les Allen

This utility enables selected files of up to 219 blocks in length to be transferred between diskettes. The DESTINATION diskette must be formatted prior to use.

In Use

Boot up the utility, insert the SOURCE disk into the drive, press REUTRN and select Y or N to choose files to copy.

As many files as can be completely loaded into memory will be loaded. At the prompt insert the DESTINATION disk to save, repeating the process as many times as necessary.

Data transfer is at a speed of approximately six times normal load and save rates.

The program as listed must be typed in exactly as written and saved prior to running. Error trap routines are inlcuded to ensure that the data as read is correct. The program when run stores the relevant code at a temporary address of $8000 and when prompted relocates the working program to Basic ($0801) and saves to disk the program FAST FILE COPIER.

```
PROGRAM: FAST FILE BOOT

38  10 M1=32768:M2=36720:CH=0
97  11 PRINTCHR$(144)CHR$(147)
C8  12 POKE52,120:POKE56,120:POKE
    53280,15:POKE53281,12
94  13 PRINT
8F  14 PRINTSPC(8)CHR$(18)"[SU,S*
    22,SI]
26  15 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
B4  16 PRINTSPC(8)CHR$(18)"[S-,SP
    C4]DATA  STATEMENT[SPC3,S-]
3C  17 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
E5  18 PRINTSPC(8)CHR$(18)"[S-]
    TO MEMORY  ROUTINE  [S-]
4A  19 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
22  20 PRINTSPC(8)CHR$(18)"[S-,SP
    C5]BY LES ALLAN[SPC5,S-]
50  21 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
6C  22 PRINTSPC(8)CHR$(18)"[SJ,S*
    22,SK]
A0  23 PRINT:PRINTCHR$(155)
42  24 PRINT" THIS ROUTINE READS
    THE DATA STATEMENT,"
80  25 PRINT
17  26 PRINT" CONVERTS FROM  HEX
    TO BINARY AND POKES"
82  27 PRINT
C4  28 PRINT" CODE BACK  TO THE
    AREA OF MEMORY FROM"
84  29 PRINT
19  30 PRINT" WHICH  IT  WAS  PRE
    VIOUSLY  GENERATED."
59  31 PRINT:PRINT
D0  32 READCODE$
BB  33 LB=ASC(RIGHT$(CODE$,1))-48
    :IFLB>9THENLB=LB-7
CF  34 HB=ASC(LEFT$(CODE$,1))-48:
    IFHB>9THENHB=HB-7
32  35 PRINTSPC(5)CHR$(5)"READING
     MEMORY BLOCK ...";M1:PRINTCH
    R$(145);
28  36 POKEM1,HB*16+LB:M1=M1+1:CH
    =CH+HB+LB:IFM1<M2THEN32
DC  37 IFCH=56904THEN39
13  38 PRINT"CHECK SUM ERROR - CH
    ECK DATA STATEMENTS!":PRINTCH
    R$(19):END
EC  39 PRINT"  HIT RETURN TO SAVE
     COMPLETED PROGRAM"
D1  40 GETKEY$:IFKEY$<>CHR$(13)TH
    EN40
54  41 SYS36624
10  42 :
CE  43 ::::::::::::::::: DATUM S
    TATEMENTS :::::::::::::::::
16  44 :
AD  45 DATA 00,0B,08,00,00,9E,32,
    30,36,31,00,00,00,20,44,E5
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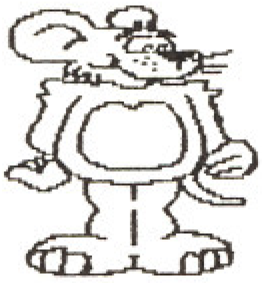
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10  46 DATA A9,0C,8D,20,D0,8D,21,
    D0,EA,A9,36,85,01,4C,2F,16
9F  47 DATA 01,A2,00,BD,00,20,9D,
    00,08,E8,E0,70,D0,F5,20,44
AF  48 DATA E5,A9,0C,8D,20,D0,8D,
    21,D0,A9,00,85,FB,A9,08,85
FC  49 DATA FC,A0,01,B1,FB,49,44,
    91,FB,AD,20,D0,49,03,8D,20
0C  50 DATA D0,C8,D0,EF,E6,FC,A5,
    FC,C9,D0,D0,E7,A9,00,8D,00
6A  51 DATA 08,A9,37,85,01,20,60,
    A6,20,8E,A6,4C,AE,A7,EE,EE
54  52 DATA 94,AE,03,FF,64,03,4E,
    08,49,4C,ED,53,E4,52,64,5A
7E  53 DATA EF,ED,44,C1,82,64,A0,
    BB,8D,49,94,BD,24,44,09,FF
D1  54 DATA AE,0C,FF,ED,2E,E4,52,
    64,5A,EF,AE,64,A0,BB,8D,49
40  55 DATA 94,BD,24,44,05,FF,AE,
    AE,44,07,FF,64,5A,EF,2C,2C
87  56 DATA 64,B6,4C,08,FD,4E,44,
    05,FF,64,E1,BB,74,45,24,ED
82  57 DATA E4,E4,52,64,5A,EF,ED,
    44,C1,82,64,A0,BB,8D,49,94
C3  58 DATA BD,08,50,4C,44,07,FF,
    E4,47,E6,53,64,48,A1,64,EA
AA  59 DATA 49,64,E1,BB,8D,49,B4,
    41,64,96,BB,94,B0,08,EF,BB
40  60 DATA 64,6E,4D,64,14,4D,94,
    43,64,63,4D,E4,46,94,B0,64
13  61 DATA EF,BB,ED,4C,64,F5,BB,
    ED,A4,64,D7,BB,08,EA,BB,64
71  62 DATA 00,A1,ED,4C,64,F5,BB,
    ED,B4,64,D7,BB,ED,60,64,EC
F0  63 DATA BB,64,EA,BB,ED,4C,64,
    F0,BB,ED,24,64,D2,BB,ED,44
3A  64 DATA C1,D4,E4,47,24,C0,F3,
    64,E1,BB,C1,87,64,E1,BB,C1
41  65 DATA 80,E0,D4,94,55,E0,F3,
    CC,94,AF,E2,87,E1,80,64,89
25  66 DATA F9,64,3B,4D,ED,44,24,
    64,94,4C,B4,41,64,96,BB,94
AE  67 DATA B2,08,C0,4D,ED,64,08,
    96,BB,ED,49,08,96,BB,E1,24
D7  68 DATA 8D,64,D4,43,ED,17,E4,
    53,08,84,4C,E1,80,B4,43,ED
84  69 DATA B9,E4,52,08,5A,EF,E1,
    87,8D,A2,F4,B7,E1,24,64,B5
1F  70 DATA 4D,E6,44,AC,F9,04,47,
    8D,66,94,BC,C2,25,AC,F9,04
4E  71 DATA 47,8D,66,B4,42,D5,26,
    AC,8C,94,B7,CE,E0,24,5C,A1
19  72 DATA 25,DD,50,5C,E1,87,DD,
    70,5C,F9,04,47,94,43,ED,5F
AB  73 DATA E4,53,08,5A,EF,8D,17,
    B4,43,8D,14,B4,47,AC,94,AD
51  74 DATA DD,10,5C,A2,24,24,E4,
    44,4E,4E,C0,27,4E,62,27,4E
26  75 DATA 62,27,C1,26,E1,26,5C,
    2D,F2,C1,26,E1,27,2D,5C,C1
E5  76 DATA 27,24,E2,1B,F9,50,5C,
    C1,25,CE,64,B5,4D,F5,26,64
64  77 DATA 96,BB,DD,04,47,8C,80,
    25,94,B7,E6,47,F9,03,53,DD
BE  78 DATA 04,47,8C,8E,54,B2,E2,
    1B,F9,10,5C,DD,79,47,24,C1
81  79 DATA FD,DC,E6,04,E4,47,64,
    F9,BB,08,91,B7,ED,44,C1,24
C9  80 DATA 64,6E,4D,64,14,4D,64,
    36,4D,64,C0,4D,E4,46,64,14
B7  81 DATA 4D,E4,44,64,E1,BB,B4,
    4D,64,96,BB,DD,04,47,8C,94
82  82 DATA B6,64,E1,BB,64,E1,BB,
    E1,D4,94,7F,ED,44,C1,4C,ED
FE  83 DATA 5A,C1,97,AE,07,FF,64,
    A5,BB,94,47,08,5E,4D,64,A0
BB  84 DATA BB,8D,0A,B4,57,8D,1D,
    94,A9,ED,49,64,96,BB,AE,AE
44  85 DATA 64,CD,4D,E4,45,08,1D,
    4E,ED,AD,E4,52,64,5A,EF,08
7D  86 DATA E6,4E,64,5E,4D,E1,24,
    94,45,24,E6,44,C2,1B,AE,03
11  87 DATA FF,ED,49,64,96,BB,ED,
    49,64,96,BB,AE,06,FF,E6,44
FB  88 DATA C2,1A,E2,1B,ED,F2,D9,
    30,5C,ED,5E,D9,D1,5C,ED,6B
52  89 DATA E4,53,64,5A,EF,E2,1B,
    F9,30,5C,C1,EA,F9,D1,5C,C1
35  90 DATA EB,64,49,4E,ED,44,64,
    7E,4E,64,9A,4F,D4,53,64,C0
46  91 DATA 4D,64,BD,4C,E2,1B,ED,
    44,D9,50,5C,F9,30,5C,C1,EA
49  92 DATA F9,D1,5C,C1,EB,E2,1B,
    AC,7C,E1,EA,D9,30,5C,E1,EB
90  93 DATA D9,D1,5C,39,70,5C,F4,
    4E,A0,24,F4,42,A2,1B,A2,1A
15  94 DATA 94,E8,7C,E1,1A,C1,18,
    E1,1B,A1,1A,C1,1B,64,85,4F
9F  95 DATA E2,1B,F9,50,5C,B4,71,
    ED,7F,E4,53,64,5A,EF,64,49
9A  96 DATA 4E,ED,13,DD,7B,47,E2,
    1B,F9,30,5C,C1,E8,F9,D1,5C
E1  97 DATA C1,E9,F9,31,5C,C1,EA,
    F9,D2,5C,C1,EB,ED,45,64,7E
90  98 DATA 4E,64,C3,48,D4,42,64,
    C0,4D,64,BD,4C,82,1A,74,4C
5E  99 DATA A2,1B,ED,44,B4,FE,AE,
    AE,64,E0,4F,D4,42,E1,18,C1
09  100 DATA 1A,54,DB,A2,1B,E1,1B
    ,81,24,F4,42,64,E6,4C,08,94
74  101 DATA 4E,24,ED,3A,E4,53,64
    ,5A,EF,5C,D4,42,AE,04,FF,5C
C2  102 DATA 24,64,A0,BB,8D,0A,B4
    ,B3,8D,1D,94,B1,7C,24,ED,44
EC  103 DATA C1,82,AE,05,FF,ED,89
    ,E4,53,64,5A,EF,AE,05,FF,64
28  104 DATA A0,BB,8D,49,94,BD,24
    ,ED,05,E4,4B,C1,B8,C0,B9,ED
24  105 DATA 44,E4,40,C1,BA,C0,BB
    ,ED,15,E4,41,C1,D4,C0,D7,64
B7  106 DATA 44,49,ED,81,64,EC,BB
    ,ED,40,64,EC,BB,64,EA,BB,3C
94  107 DATA 64,38,49,54,47,08,32
    ,48,4C,64,38,49,6C,94,48,EE
DE  108 DATA 8E,C2,E0,4C,2C,4D,04
    ,0C,6C,34,41,FC,ED,BA,C1,E0
EF  109 DATA E4,44,E9,44,99,4D,4C
    ,C9,44,99,E9,44,99,54,BF,E9
1E  110 DATA 44,99,6D,47,C9,44,99
    ,E6,4E,8E,94,B9,E6,40,E9,44
23  111 DATA 99,4E,6E,22,D4,0E,22
    ,D4,AE,8E,94,B6,E1,D4,E6,70
A4  112 DATA C2,45,D5,EA,E6,73,C2
    ,45,8C,94,A5,4C,5C,E1,E0,21
49  113 DATA EA,C1,EA,D4,46,A2,EB
    ,6C,34,47,08,43,48,ED,44,EC
82  114 DATA 64,8A,4A,ED,04,C1,D4
    ,DC,54,47,08,77,B2,08,6F,B1
F1  115 DATA ED,D6,E4,54,C1,B8,C0
    ,B9,ED,44,E4,40,C1,BA,C0,BB
32  116 DATA ED,8E,E4,42,C1,D4,C0
    ,D7,64,44,49,E9,44,99,6D,47
9A  117 DATA C1,D7,ED,B2,64,EC,BB
    ,ED,41,64,EC,BB,64,EA,BB,3C
0B  118 DATA ED,44,C1,BA,64,12,49
    ,64,38,49,74,60,E4,44,ED,70
92  119 DATA C1,45,F5,E8,0C,01,BA
    ,C1,BA,ED,73,C1,45,2C,64,8B
60  120 DATA 49,64,9F,B8,8E,94,A1
    ,E1,BA,64,8B,49,34,42,14,94
0E  121 DATA 74,4C,54,9C,64,8B,49
    ,64,38,49,4C,64,8A,4A,ED,44
DB  122 DATA C1,D4,6C,54,46,7C,24
    ,5C,24,64,86,49,ED,13,64,EC
3E  123 DATA BB,E1,BA,64,EC,BB,E1
    ,BB,64,EC,BB,ED,5A,64,EC,BB
0A  124 DATA E4,44,F5,B8,64,EC,BB
    ,8C,84,5A,D4,B2,64,EA,BB,5C
7D  125 DATA E1,B8,2D,5A,C1,B8,D4
    ,47,A2,B9,5C,E1,BA,E2,BB,2D
4C  126 DATA 5A,C1,BA,D4,46,A2,BB
    ,A0,D7,D4,FA,81,D4,D4,FE,E9
E6  127 DATA 55,94,6D,AB,C9,55,94
    ,64,86,49,ED,01,08,EC,BB,7C
3C  128 DATA E1,EA,A1,E8,EE,EC,E1
    ,EB,A1,E9,94,4C,A4,BB,F4,40
8A  129 DATA 8C,DC,94,43,E6,BA,ED
    ,44,FC,B4,43,4C,2C,4D,04,0C
28  130 DATA 6C,DC,08,8B,49,E9,44
    ,99,6D,47,4D,4C,C9,44,99,E9
6A  131 DATA 44,99,54,BF,E9,44,99
    ,6D,47,C9,44,99,E4,41,CC,AE
00  132 DATA 94,B8,E4,40,E9,44,99
    ,4E,6E,22,D4,0E,22,D4,AE,CC
D6  133 DATA 94,B6,E1,D4,0D,BB,24
    ,ED,4C,64,F0,BB,ED,2B,08,D2
02  134 DATA BB,ED,4C,64,F5,BB,ED
    ,2B,08,D7,BB,64,FC,49,ED,09
B1  135 DATA 64,EC,BB,ED,69,08,EC
    ,BB,C1,D4,E9,44,99,6D,47,4D
34  136 DATA 4C,C9,44,99,E9,44,99
    ,54,BF,E9,44,99,6D,47,C9,44
58  137 DATA 99,E4,40,E1,D7,02,D4
    ,2E,02,D4,2E,0E,0E,C9,44,99
7F  138 DATA CC,94,B4,E4,45,CC,94
    ,B9,24,44,A6,FF,64,0A,49,08
73  139 DATA 70,4B,E1,00,E6,A0,8D
    ,46,D4,45,8E,C2,01,CE,24,64
99  140 DATA EC,BB,64,EA,BB,3C,ED
    ,5D,C1,07,ED,50,C1,06,64,E8
90  141 DATA 4A,08,8B,49,ED,47,C9
    ,44,99,E9,55,94,4D,54,C9,55
E0  142 DATA 94,1C,5C,24,64,38,49
    ,54,BD,6D,3B,64,40,4B,CA,42
B0  143 DATA 5C,C8,43,5C,64,38,49
    ,64,40,4B,CA,55,5C,C8,56,5C
CC  144 DATA ED,B1,E4,53,64,5A,EF
    ,3C,7C,24,0C,0E,04,FF,BC,EE
46  145 DATA B4,4C,5C,ED,44,2D,52
    ,8E,94,BF,C1,04,9C,2C,6D,4B
9C  146 DATA 8D,4E,D4,46,2D,41,BC
    ,21,04,9C,0C,0E,04,FF,4D,74
F5  147 DATA EE,2C,6D,4B,4D,74,EC
    ,24,ED,66,64,EC,BB,ED,AF,64
F6  148 DATA EC,BB,08,EA,BB,ED,47
    ,C1,75,64,4E,B1,14,BA,FC,E9
84  149 DATA 45,58,D5,74,8C,94,B1
    ,E4,FE,14,BA,FC,E9,45,58,DD
91  150 DATA 44,45,8C,94,B0,64,A4
    ,BC,E1,7C,81,03,B4,47,08,B2
0E  151 DATA B0,64,AD,B1,81,7E,B4
    ,47,08,46,B1,E9,44,47,64,CE
FF  152 DATA 40,E9,45,47,64,CE,40
    ,E4,46,68,44,5C,54,BF,ED,54
9D  153 DATA C9,44,5C,68,44,5C,74
    ,BF,FD,44,47,0D,BB,C1,4B,E6
54  154 DATA 40,ED,44,02,4B,6E,4E
    ,02,4B,6E,4E,C9,44,5C,8E,94
5C  155 DATA B4,8C,AE,AE,94,A6,ED
    ,4B,C9,44,5C,E9,45,47,C1,4D
4F  156 DATA E9,44,47,81,4C,94,47
    ,08,40,40,C1,4C,08,5C,B0,C1
BC  157 DATA 4B,68,44,5C,54,BF,ED
    ,54,C9,44,5C,68,44,5C,74,BF
16  158 DATA E6,40,ED,44,02,4B,6E
    ,4E,02,4B,6E,4E,C9,44,5C,8E
A9  159 DATA 94,B4,E6,45,8E,94,B9
    ,AE,AE,ED,4B,C9,44,5C,24,C1
E0  160 DATA 45,1C,E1,45,74,B8,3C
    ,8D,46,24,3C,E1,5C,8D,56,94
9F  161 DATA 41,ED,26,08,7D,41,C1
    ,4C,E1,5D,C1,4D,ED,44,C1,42
E9  162 DATA C1,43,C1,54,C1,49,E6
    ,40,ED,F4,64,FE,40,D4,41,8E
7B  163 DATA 94,B2,F4,43,ED,A4,64
    ,FE,40,D4,68,E1,54,B4,49,82
54  164 DATA 54,ED,84,64,FE,40,ED
    ,44,C1.42,C1,43,E0,42,FD,9F
4E  165 DATA BA,B4,65,E1,43,7C,BD
    ,9F,BA,C1,43,FD,9F,BA,1C,64
41  166 DATA 32,92,3C,A2,42,94,FB
    ,E1,43,1C,64,32,92,3C,E1,4C
EE  167 DATA 94,EE,B4,5B,E1,49,94
    ,42,A2,54,A2,49,94,EC,0C,4D
8A  168 DATA C4,64,CE,40,2C,8D,26
    ,94,47,64,8C,85,E6,45,E1,45
EC  169 DATA 64,4E,A2,08,D0,85,E1
    ,00,0E,05,FF,EE,F9,82,42,C1
99  170 DATA 2D,E4,40,8E,94,45,8C
    ,C0,43,ED,44,C1,42,64,A3,40
24  171 DATA B4,4A,C1,C5,C1,83,EE
    ,AC,C2,4A,ED,44,C1,C4,B4,48
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86 172 DATA 64,10,41,F4,41,ED,36
   ,08,2D,BD,ED,44,64,53,41,E1
89 173 DATA C4,C9,44,47,E1,C5,C9
   ,45,47,ED,47,C1,75,E4,46,64
40 174 DATA A3,40,D5,74,8C,80,4A
   ,94,B2,64,A3,40,E2,42,D9,44
44 175 DATA 46,E1,4D,D9,51,46,C1
   ,4F,64,14,45,A2,48,E1,83,94
94 176 DATA 4A,E1,C5,C1,4D,E1,C4
   ,81,4C,94,40,A2,42,94,DA,ED
1F 177 DATA 44,C1,4D,64,4E,B1,14
   ,BA,FC,E9,45,58,D5,74,8C,94
DC 178 DATA B1,C0,4E,E4,FE,14,BA
   ,FC,E9,45,58,DD,44,45,8C,94
86 179 DATA B0,64,A4,BC,E2,42,F9
   ,51,46,81,4D,B4,41,8E,54,B2
06 180 DATA 74,5E,E1,4A,E0,4D,80
   ,4F,94,46,C1,4E,E4,46,F9,44
3F 181 DATA 46,15,74,8C,80,4E,94
   ,BD,8D,44,94,58,5C,E1,4D,21
23 182 DATA 43,81,07,C1,4D,D4,E8
   ,A1,07,C1,4D,94,E2,E1,C4,C1
7B 183 DATA 4C,E1,C5,C1,4D,08,5C
   ,B0,08,81,B2,68,44,5C,54,BF
18 184 DATA ED,54,C9,44,5C,68,44
   ,5C,74,BF,E6,40,8E,94,B9,CA
7A 185 DATA 44,5C,E6,40,E9,44,5C
   ,0E,4C,0E,0E,22,4B,6C,22,4B
89 186 DATA 8E,94,B5,ED,4B,C9,44
   ,5C,E1,4B,24,C1,4B,68,44,5C
BE 187 DATA 54,BF,ED,54,C9,44,5C
   ,68,44,5C,74,BF,E6,40,ED,44
E7 188 DATA 02,4B,6E,4E,02,4B,6E
   ,4E,C9,44,5C,8E,94,B4,E6,45
01 189 DATA 8E,94,B9,AE,AE,ED,4B
   ,C9,44,5C,24,ED,A4,C1,45,1C
80 190 DATA E1,45,74,B8,3C,8D,46
   ,24,ED,47,C1,49,64,88,41,94
D3 191 DATA 74,E1,C4,8D,56,B4,52
   ,D4,52,A2,C4,E1,C4,8D,60,94
F9 192 DATA AF,E6,55,C2,C4,ED,44
   ,C1,C5,82,49,94,9B,5C,24,82
4A 193 DATA C4,94,9D,E6,57,C2,C4
   ,ED,44,C1,C5,82,49,94,89,B4
C1 194 DATA A8,E1,C5,5C,21,2D,C1
   ,C5,E1,C4,64,0F,B6,C9,0A,46
12 195 DATA 81,C5,F4,48,7C,E1,C5
   ,A9,0A,46,C1,C5,B4,46,82,C5
8D 196 DATA 64,93,41,94,4D,ED,44
   ,C1,C5,64,93,41,B4,FB,F5,29
33 197 DATA 19,AD,AB,D5,29,E4,44
   ,F5,29,7C,AD,45,D5,29,7C,24
08 198 DATA E1,C4,4E,4E,C1,29,E4
   ,44,F5,29,24,E4,44,C0,2B,E1
BA 199 DATA C4,64,0F,B6,C9,0A,46
   ,E1,C5,89,0A,46,F4,4D,64,91
1F 200 DATA AB,94,42,A2,C5,94,B4
   ,ED,44,24,64,06,94,64,EC,42
D7 201 DATA 3C,B4,4B,E9,44,58,6D
   ,54,94,40,ED,4C,94,14,ED,27
53 202 DATA 94,08,E4,45,F5,C2,B4
   ,B2,C1,4C,C1,C4,8C,F5,C2,C1
ED 203 DATA 4D,C1,C5,E6,27,F9,31
   ,B1,D9,14,45,8E,54,B3,ED,24
B7 204 DATA C9,F0,45,AC,C2,4A,C2
   ,83,C2,48,64,88,41,64,93,41
14 205 DATA 64,FE,41,E6,40,ED,F4
   ,64,0D,41,D4,41,8E,94,B2,F4
28 206 DATA 4F,64,03,41,F4,42,E1
   ,83,B4,AF,94,5E,8D,36,0C,B4
7E 207 DATA 47,64,A3,40,4D,C4,64
   ,53,41,2C,8D,27,F4,41,E6,45
47 208 DATA 64,4E,A2,64,8C,85,64
   ,A3,40,ED,44,64,53,41,1C,64
6E 209 DATA EC,42,F5,C2,4D,C4,D5
   ,C2,E4,58,E1,48,D5,C2,ED,D4
C0 210 DATA 64,E4,42,ED,56,C1,4A
   ,ED,D4,E6,40,64,E6,42,64,06
8C 211 DATA 94,08,D0,85,E6,44,64
   ,39,91,08,DD,91,E9,25,46,C1
40 212 DATA 43,ED,56,C1,42,ED,C4
   ,64,E4,42,ED,47,C1,C3,E9,23
DF 213 DATA 46,C1,C2,E4,44,F5,C2
   ,6D,C4,24,4D,4E,4E,4F,44,FF
B1 214 DATA FF,44,FF,FF,44,71,FF
   ,D7,D4,64,64,56,00,01,17,10
47 215 DATA 0D,0A,05,10,0D,0B,0A
   ,64,00,0D,17,0F,17,64,09,11
4C 216 DATA 17,10,64,06,01,64,02
   ,0B,16,09,05,10,10,01,00,49
CD 217 DATA 49,64,64,DF,0D,0A,17
   ,01,16,10,64,17,0B,11,16,07
79 218 DATA 01,64,00,0D,17,0F,64
   ,05,0A,00,64,14,16,01,17,17
01 219 DATA 64,16,01,10,11,16,0A
   ,49,49,64,64,41,06,FF,17,01
49 220 DATA 08,01,07,10,64,02,0D
   ,08,01,17,64,13,0D,10,0C,CA
24 221 DATA 64,1D,64,0B,16,64,0A
   ,49,44,1C,FF,49,44,0E,FF,CA
17 222 DATA 03,FF,49,49,DF,03,FF
   ,0D,0A,17,01,16,10,64,17,0B
F7 223 DATA 11,16,07,01,64,00,0D
   ,17,0F,CA,49,D4,14,16,01,17
B5 224 DATA 17,64,16,01,10,11,16
   ,0A,41,03,FF,49,44,09,FF,49
ED 225 DATA 49,DF,03,FF,01,16,16
   ,0B,16,64,0B,0A,64,17,0B,11
F2 226 DATA 16,07,01,64,00,0D,17
   ,0F,49,D4,14,16,01,17,17,64
13 227 DATA 16,01,10,11,16,0A,49
   ,49,44,0A,FF,D6,44,15,FF,49
47 228 DATA D5,44,12,FF,C9,02,0D
   ,08,01,64,10,0B,0B,64,08,0B
79 229 DATA 0A,03,C9,49,44,0E,FF
   ,C9,02,0D,08,01,10,1D,14,01
14 230 DATA 64,01,16,16,0B,16,64
   ,64,C9,49,44,CA,D7,08,0B,05
11 231 DATA 00,0D,0A,03,59,59,44
   ,CA,D7,17,05,12,0D,0A,03,59
76 232 DATA 59,44,44,16,68,14,68
   ,44,08,FF,49,03,FF,0A,05,09
EC 233 DATA 01,64,06,11,02,02,01
   ,16,64,02,11,08,08,49,04,FF
38 234 DATA 44,14,FF,49,05,FF,05
   ,0A,0B,10,0C,01,16,64,0B,11
D5 235 DATA 10,14,11,10,64,1D,64
   ,0B,16,64,0A,64,7B,44,33,FF
21 236 DATA 41,04,FF,49,49,CA,0D
   ,0A,17,01,16,10,64,00,01,17
24 237 DATA 10,0D,0A,05,10,0D,0B
   ,0A,64,00,0D,17,0F,49,D4,CA
D0 238 DATA 14,16,01,17,17,64,16
   ,01,10,11,16,0A,CA,49,04,FF
C6 239 DATA 44,15,FF,47,44,1F,FF
   ,5D,44,1F,FF,14,44,1F,FF,F2
04 240 DATA F3,44,1F,FF,5E,76,44
   ,1F,FF,02,02,76,44,FF,FF,44
0F 241 DATA FE,FF,45,44,74,44,65
   ,C6,70,F1,71,4B,EB,EA,EA,FA
10 242 DATA 03,FF,FE,BA,BD,4C,6C
   ,44,48,E4,EF,61,C4,39,70,EF
EF 243 DATA E1,D4,44,4E,46,44,03
   ,FF,C4,BE,03,FF,51,AE,8D,24
C5 244 DATA 44,03,FF,3C,C5,A1,44
   ,14,44,2E,1E,78,38,50,44,44
CA 245 DATA EC,BD,4C,44,BD,FF,E1
   ,B4,BB,E9,60,04,60,0B,DB,BE
C8 246 DATA 74,BE,3A,AF,86,4E,4C
   ,46,EE,BB,D4,C0,BB,E1,E0,D4
34 247 DATA EB,56,C6,46,CB,64,8B
   ,4E,3B,B9,78,AE,57,B5,BB,43
C8 248 DATA 8D,E1,4D,F9,E6,C2,49
   ,5F,67,06,5B,14,C4,44,45,85
AD 249 DATA BB,BB,3E,BD,44,1C,4E
   ,44,BD,FF,62,E1,92,CA,CA,B1
64 250 DATA C2,DB,64,71,41,94,6D
   ,78,11,21,E5,14,EB,B8,24,64
6B 251 DATA 36,4D,04,C4,63,23,07
   ,BE,1B,D4,D4,E9,FA,06,44,4E
16 252 DATA 17,12,47,BE,4D,1D,E4
   ,EF,E4,C6,CD,ED,72,D3,BB,EB
A4 253 DATA 4E,BE,6D,05,AE,CE,13
   ,E5,42,47,64,44,BD,FF,7E,4F
E6 254 DATA 54,67,46,B0,FE,14,C1
   ,9E,BE,15,EF,EF,FA,0A,13,13
DB 255 DATA B4,FB,71,53,64,13,DE
   ,25,12,B2,FE,14,44,34,44,16
9F 256 DATA 51,11,EF,AD,ED,40,ED
   ,E8,4C,24,53,5C,EE,C4,63,63
D4 257 DATA A7,14,EB,9E,A4,EA,46
   ,44,2E,65,EE,E5,EE,E5,64,44
CB 258 DATA BE,FF,64,40,C7,C5,48
   ,64,C4,EE,C4,C1,DF,6E,04,6C
C2 259 DATA 04,EF,44,EC,BB,44,22
   ,D4,B6,B0,FE,42,67,D2,46,CE
8B 260 DATA 31,C4,D4,6D,90,06,6E
   ,25,EC,E5,EC,C0,49,6D,ED,BB
1B 261 DATA E4,BA,50,71,44,D4,54
   ,A1,3E,52,86,39,8E,45,46,B7
36 262 DATA 47,4A,44,BD,FF,ED,6C
   ,C4,4C,C5,BE,D3,BE,C4,54,BE
07 263 DATA 45,AE,3B,7B,7B,ED,E5
   ,BD,D0,D4,94,55,49,E4,FE,E6
E3 264 DATA F3,BB,CB,AE,4E,D1,46
   ,04,86,6C,04,EF,44,EC,90,E9
5B 265 DATA 6E,22,94,61,66,E3,BA
   ,80,81,C4,41,9E,1B,04,44,39
D6 266 DATA 80,B3,44,ED,1E,4E,44
   ,14,FF,4F,4C,44,44,DA,76,74
B3 267 DATA 72,75,44,03,FF,08,04
   ,4C,ED,4B,C9,64,94,ED,48,C9
F3 268 DATA 65,94,24,E9,64,94,0D
   ,47,C9,64,94,24,AE,1C,FF,3C
E1 269 DATA E6,BF,DE,64,5C,A1,64
   ,8A,4A,64,54,4C,1C,64,00,A1
F0 270 DATA E6,44,E4,46,64,48,A1
   ,ED,8F,E4,51,64,5A,EF,64,A0
3C 271 DATA BB,8D,49,B4,42,64,5F
   ,4C,08,1B,4C,ED,4B,C9,64,A2
AC 272 DATA 00,BD,71,16,9D,10,01
   ,E8,D0,F7,A2,34,BD,D8,16,9D
1E 273 DATA 00,03,E8,D0,F7,EA,EA
   ,A2,FF,9A,A9,70,85,2D,38,E9
7F 274 DATA 01,85,FE,A9,20,85,2E
   ,E9,00,85,FF,A9,2E,85,FC,A9
63 275 DATA 16,85,FD,AD,21,D0,85
   ,FB,4C,52,01,00,00,00,00,00
94 276 DATA 00,00,0B,08,00,00,9E
   ,32,30,36,31,00,00,00,A2,00
04 277 DATA BD,1D,08,9D,A7,02,E8
   ,E0,59,D0,F5,4C,A7,02,A9,36
4A 278 DATA 85,48,C6,FC,A5,FC,C9
   ,FF,D0,02,C6,FD,68,60,48,AD
55 279 DATA 20,D0,49,03,8D,20,D0
   ,C6,FE,A5,FE,C9,FF,D0,02,C6
8F 280 DATA FF,68,60,A0,00,B1,FC
   ,C9,FF,D0,18,EA,EA,EA,20,30
C9 281 DATA 01,B1,FC,AA,20,30,01
   ,B1,FC,91,FE,20,3D,01,CA,D0
04 282 DATA F8,F0,05,91,FE,20,3D
   ,01,A6,FC,CA,86,FC,E0,FF,D0
F7 283 DATA 02,C6,FD,A5,FE,C9,1F
   ,A5,FF,E9,08,B0,C8,A5,FB,8D
06 284 DATA 20,D0,A9,37,85,01,20
   ,60,A6,20,8E,A6,A2,1F,BD,10
40 285 DATA 01,9D,00,08,CA,D0,F7
   ,A9,FF,4C,34,03,4C,AE,A7,EE
20 286 DATA A9,00,A8,85,FB,85,FD
   ,A9,80,85,FC,A9,08,85,FE,B1
6E 287 DATA FB,91,FD,C8,D0,F9,E6
   ,FC,E6,FE,A5,FC,C9,A0,D0,EF
4A 288 DATA A9,08,AA,A8,20,BA,FF
   ,A9,10,A2,54,A0,8F,20,BD,FF
70 289 DATA A9,01,85,2B,A9,08,85
   ,2C,A9,2B,A2,10,A0,17,20,D8
3C 290 DATA FF,4C,66,FE,46,41,53
   ,54,20,46,49,4C,45,20,43,4F
F7 291 DATA 50,49,45,52,EE,EE,EE
   ,EE,EE,EE,EE,EE,EE,EE,EE,EE
1F 292 :
1C 293 :
A7 294 :::::::::::::::::::::::::::
   ::::::::::::
EB 295 :  FAST FILE COPIER  BY L
   ES ALLAN  :
4D 296 :
              :
5B 297 :  28 ATKINSON DRIVE  NEW
   PORT  IW  :
AB 298 :::::::::::::::::::::::::::
   ::::::::::::
```

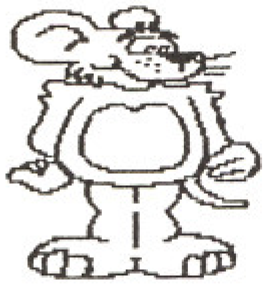
```
ED,40,ED
,63,63
4,EA,46
,64,44
7,C5,48
,04,6C
B,44,22
,46,CE
0,06,6E
ED,BB
4,D4,54
46,B7
F,ED,6C
54,BE
B,ED,E5
FE,E6
E,D1,46
90,E9
6,E3,BA
44,39
E,4E,44
76,74
F,08,04
48,C9
4,94,0D
FF,3C
C,A1,64
00,A1
4,48,A1
64,A0
2,64,5F
64,A2
D,10,01
16,9D
7,EA,EA
38,E9
0,85,2E
FC,A9
1,D0,85
00,00
0,00,9E
A2,00
7,02,E8
A9,36
5,FC,C9
48,AD
D,20,D0
02,C6
0,B1,FC
20,30
0,30,01
CA,D0
E,20,3D
FF,D0
E,C9,1F
FB,8D
5,01,20
BD,10
A,D0,F7
A7,EE
B,85,FD
FE,B1
0,F9,E6
D0,EF
0,BA,FF
BD,FF
9,08,85
20,D8
6,41,53
43,4F
E,EE,EE
EE,EE

:::::::
R  BY L

VE  NEW
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```



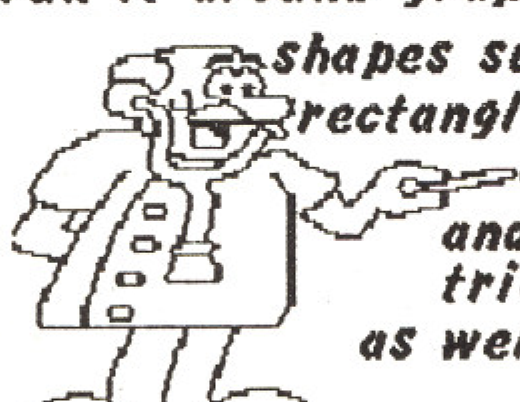
Stop Press



Mice, icons, pointers and menus are all part of this package. Tony Hetherington investigates the latest in desktop publishing.

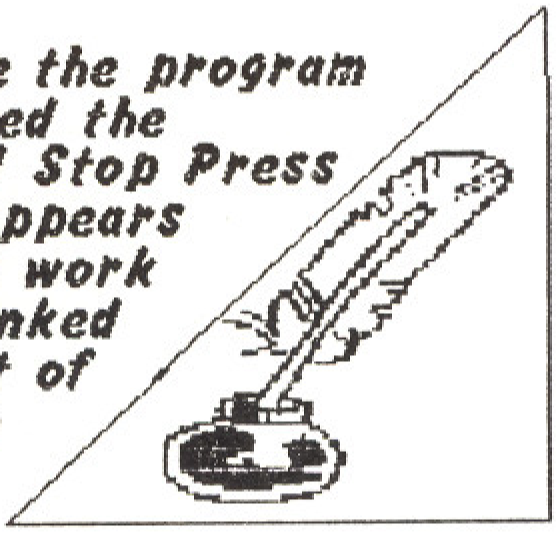
The Amx Mouse package contains a three button mouse and a disk containing Stop Press packed full of fonts and graphics that allow you to produce professional looking newspapers, posters and leaflets using your C64.

The package uses the Wimp system (Windows, Icons, Menus and Pointers) that was pioneered on machines like the Mac. to allow you to easily mix text in a variety of different typefaces and run it around graphic shapes such as rectangles, circles and triangles as well as a



bewildering library of clip art. To show that the system actually works I used the package to create this article.

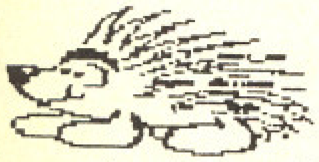
Once the program has loaded the standard Stop Press screen appears with it's work area flanked by a list of function icons and



below the label windows that list the available options for a selected function. For example, if you select the files function the labels windows will contain the options to LOAD either an entire page, font or cutout artwork. The work area window displays a fraction of the page that you are

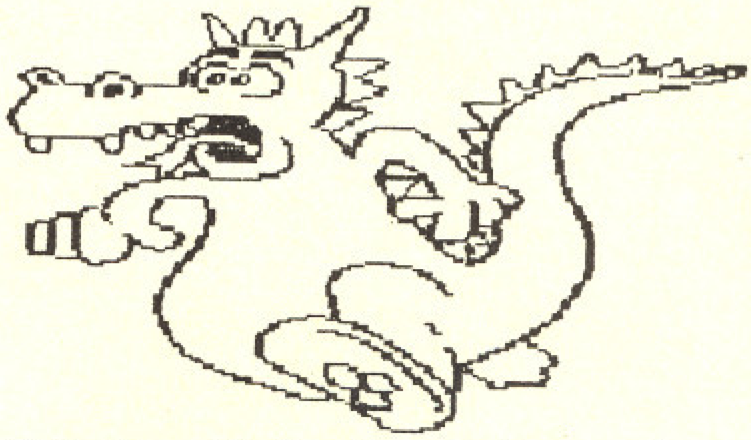
working on and can be scrolled by selecting the up or down arrow functions or can be placed in a specific area by moving the window over the preview screen of the full page.

When you've selected the area you wish to work on you can use the other functions to create, paint and fill shapes created from lines, rectangles and circles, enter text in any of the 50 different fonts supplied with Stop Press, edit your efforts by cutting, pasting and stretching any defined window and print out



a window, the screen, or the full page on a variety of supported printers.

A Stop Press page is stored on disk as a bit pattern which can cause problems particularly when your entering text. Once you've entered a line it is "written" to the page and cannot be edited as you could in a normal word processor. This is fine if you're only writing headlines or picture captions but for a sizable block of text, such as this



article, it is best to write it on a word processor (I used PaperClip) and then load the finished document into Stop Press and onto your page.

The text to be loaded in must be stored in PET ASCII and so you should check your word processor has this option. Most do, but it's best to check before you write the text. As the text is loaded from disk it will flow onto the screen until either you pause it or it fills the work area. When it's paused you can either scroll down and restart it straight away or change the font, letter size, margins or whether the text will

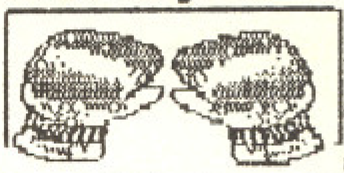
appear left, right or centre justified or will



run in autoflow around any shape (Not many newspapers can do that!).

The text handler is only half the story as to produce a professional looking paper or leaflet it's best to mix the text with graphics that are either created by you or loaded in from Stop Press's 150k of clip art. Some examples of the animals, characters and objects included in this clip art library litter these pages as examples of how they can be mixed to produce some surprising results.

You can add to this library of artwork by



saving any defined window which could be either a graphic that you've created or an often used heading such as a newsletters title.

Finally, you can edit your creation by cutting and pasting blocks of it as well as magnifying any part of the page to alter a single pixel.

Although, Stop Press is sold with the AMX mouse it can also be used with the Commodore mouse or a joystick and so Stop Press is also supplied seperately at about half the standard price.



I have only one major critiscm about the package and that involves the loading of new fonts and cut outs. These added graphics are essential but must be loaded by typing in the correct name (including capitals). There are directory options but you must then remember exactly what you want to load in. The result is somewhat unfriendly when compared to packages like Print Shop that allows you to load a clip art by selecting it from the directory.

Comparisons are bound to be made between Stop Press and programs such as Print Shop and Newsroom. Apart from the file handling routine I found that Stop Press offered more flexibility and variety.

AMX Mouse — £69.95.
Stop Press(only)= £39.95

Is it the Thought that Counts?

Does Broderbund Software's Thinking Cap idea processor offer significant advantages compared with the back of an envelope?

By Fin Fahey

I have to admit to deep distrust of the 'ideas processor' cult – it makes the Moonies look rational. I've seen perfectly reasonable people turned into drooling ideas processor fanatics simply because someone's written a few bytes of code that dignify their stray wafflings into some facsimile of creative thought.

I'm glad I've got that off my chest. In fact, it's really sour grapes – the damn things just don't work for me. Perhaps I spend far too much time looking at a monitor screen – it's a positive relief to go off and scribble my crazed ideas on the back of bus tickets.

These also have the added advantage of being easily loseable, whereas ideas processors enable you to save it all on disk, with the result that you may end up having to reread it sometime. Shudder.

Not so Bad Really

In fact Thinking Cap is a pleasant inoffensive little program. Honestly, I'm not incapable of admiring this sort of software – it just doesn't help me generate ideas.

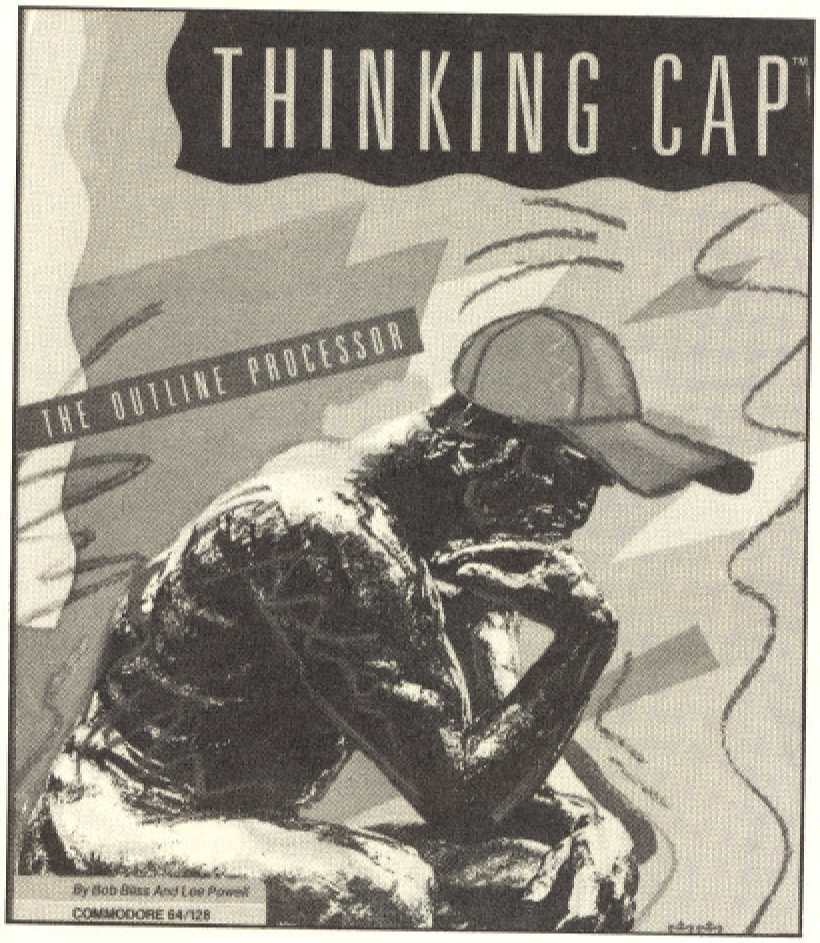
For those who haven't brushed up against the creature, an ideas processor is a sort of structured notepad. It's used to set up an outline for a task such as a business plan, a speech or a magazine article.

You may enter your thoughts as topics in any order, and enter further thoughts as sub-topics of these, further ones as sub-sub-topics *ad infinitum* (or in this case to seven levels of depth). This means that you can start with a vague idea, and harden it up as you move to deeper areas of detail. Hopefully, when you 'pan back' you find that you have a coherent plan laid out.

Friendly Facilities

Thinking Cap provides plenty of friendly facilities for helping the process along. It's pop-up menu driven, with a Help menu which smooth-scrolls beautifully up from the foot of the screen.

Broderbung ingeniously lets you use the Shift Lock to lock this in place on the screen. A full range of editing facilities is provided, including the ability to Cut, Paste and Copy from a pop-up menu.



There are two main program modes. Brainstorm is really the entry mode. Overview lets you see your ideas as a whole and allows you finer discrimination with your cutting and pasting.

Unfortunately, the program is totally keyboard-driven. This is the sort of software that I feel could benefit from mouse or joystick control, enabling you to make with the totally creative concepts while reclining languidly in your favourite armchair. Instead it's back to the dreary old function keys.

This may well be your cup of tea – after all if it makes you feel good, do it. Um – what else was I going to say? Where's that old envelope gone?

Touchline

Title: *Thinking Cap.* ***Supplier:*** *Precision Software.* ***Machine:*** *C64.*

Screen Maker

Designing the layout of a program screen can be a real pain. Speed things up with this useful utility.

By Kevin Otton

First impressions count for a lot. If a program user is confronted with a messy-looking screen then their initial reaction may not be complimentary.

But getting screen layouts just right is a time-consuming process. Screen Maker enables you to design program screens easily and quickly, ensuring that the user gets a good first impression.

Screen Maker is just 900 bytes of machine code. It allows you to design a screen using all of the Commodore graphic and character symbols, as well as colours and reverse text. When the screen is finished Screen Maker converts your screen layout into PRINT statements that can be included in any Basic program.

The program is presented in Hex format. Type this in using the Hex Data Entry II program that can be found elsewhere in this issue. Once completed you should SAVE the program to disk or tape with the name 'SCREEN MAKER'.

Using the program

When you want to use the program in future, LOAD it back into the computer with:

LOAD "SCREEN MAKER", 8,1 for disk or ..

LOAD "SCREEN MAKER", 1,1 for tape.

Once loaded you should type NEW. Then execute the program with:

SYS 49152, linenumber

where linenumber is the number of the first PRINT statement that you want to generate.

Screen Maker can only specify one screen at a time and will erase any program already in Basic memory.

Functions Available

While the program is in SCREEN mode the following functions are available:

F1 Change border colours;
F3 Change background colour;
F5 Create Basic program;
F7 Show Help screen;
F8 Exit back to Basic;

The Help screen is shown when the program is started. Press the space bar to enter SCREEN mode.

PROGRAM: SCREEN MAKER

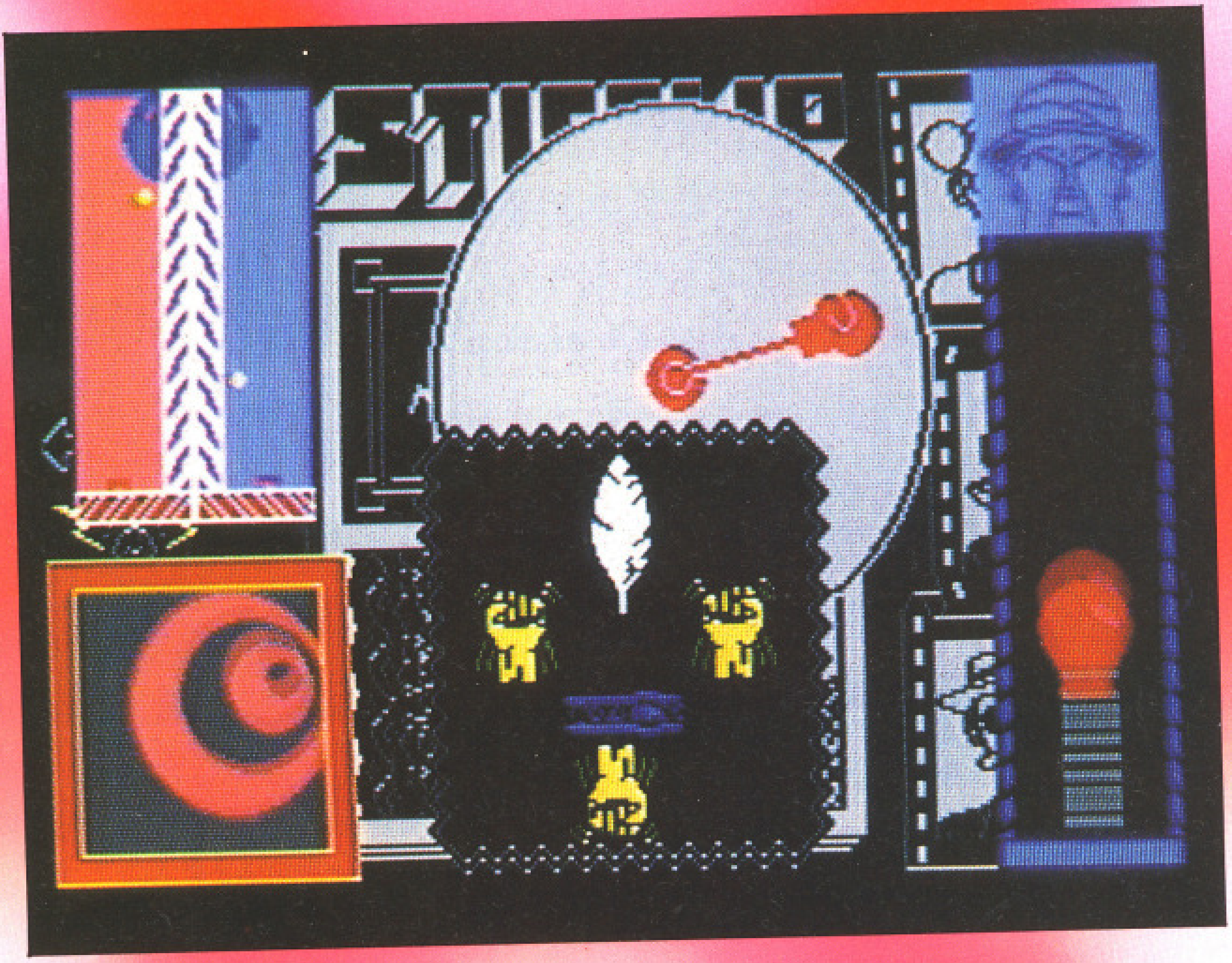
```
3F  1 PRINT"[CLR,DOWN2,RIGHT12]S
    CREEN MAKER"
16  2 PRINT"[DOWN2] ONCE THE MAC
    HINE CODE HAS LOADED"
BD  3 PRINT"[DOWN] TYPE 'NEW' AN
    D THEN ENTER"
76  4 PRINT"[DOWN2] SYS 49152,NU
    MBER
8F  5 PRINT"[DOWN2] WHERE NUMBER
     IS THE LINE THAT YOU
9A  6 PRINT"[DOWN] WANT THE BASI
    C FILE TO START FROM."
2D  10 BL=70   :LN=70   :SA=4915
    2
F9  20 FOR L=0 TO BL:CX=0:FOR D=
    0 TO 15
9F  30 READ A:IF A>255THENPRINT"
    NUMBER TO LARGE";LN+(L*10):S
    TOP
28  40 CX=CX+A:POKE SA+L*16+D,A:
    NEXT D
A9  50 READ A:IF A><CX THENPRINT
    "ERROR IN LINE";LN+(L*10):ST
    OP
4C  60 NEXT L:END
D8  70 DATA 32,253,174,32,158,17
    3,32,247,183,165,20,141,86,1
    95,165,21,2077
CD  80 DATA 141,85,195,88,32,231
    ,255,32,153,194,169,147,32,2
    10,255,169,2388
27  90 DATA 0,133,204,165,198,24
    0,252,133,204,120,165,207,24
    0,12,165,206,2644
DC  100 DATA 174,135,2,160,0,132
     207,32,19,234,32,180,229,20
    1,133,208,2078
C0  110 DATA 16,162,0,254,32,208
    ,169,15,61,32,208,157,32,208
    ,76,31,1661
4E  120 DATA 192,201,134,208,4,1
    62,1,208,234,201,140,208,10,
    169;0,133,2205
75  130 DATA 198,169,13,32,210,2
    55,96,201,136,208,6,32,153,1
    94,76,31,2010
F5  140 DATA 192,201,135,208,167
    ,76,222,192,160,5,136,185,85
    ,195,32,146,2337
86  150 DATA 192,152,208,246,169
    ,255,205,86,195,208,3,238,85
    ,195,238,86,2761
B4  160 DATA 195,96,132,38,160,0
    ,145;25,32,169,192,164,38.96
    ,41,15,1538
FA  170 DATA 170,189,116,195,168
    ,189,132,195,96,169,255,197,
    25,208,2,230,2536
F2  180 DATA 26,230,25,96,132,38
    ,160,0,145,27,164,38,169,255
    ,197,27,1729
F4  190 DATA 208,2,230,28,230,27
    ,96,160,0,177,27,32,146,192,
    32,188,1775
16  200 DATA 192,165,25,197,29,2
    08,242,165,26,197,30,208,236
    ,96,169,1,2186
5E  210 DATA 133,43,169,8,133,44
    ,133,26,162,0,142,82,195,134
    ,29,134,1567
E5  220 DATA 31,134,25,32,120,19
    2,169,255,141,83,195,162,26,
    160,0,132,1857
B5  230 DATA 27,185,90,195,32,14
    6,192,200,202,208,246,173,24
    ,208,41.2,2171
F2  240 DATA 240,5,169,14,141,28
    ,8,173,32,208,32,158,192,141
    ,12,8,1561
5D  250 DATA 140,13,8,173,33,208
    ,32,158,192,141,22,8,140,23,
    8,169,1468
9F  260 DATA 64,133,28,169,4,133
    ,30,169,216,133,32,162,0,160
    ,0,140,1573
32  270 DATA 84,195,177,29,200,2
    01,32,240,3,140,84,195,192,4
    0,208,242,2262
DE  280 DATA 173,84,195,208,41,1
    69,17,32,180,192,24,169,40,1
    01,29,133,1787
00  290 DATA 29,133,31,144,4,230
    ,30,230,32,232,224,25,208,20
    7,169,0,1928
D9  300 DATA 32,180,192,169,0,32
    ,180,192,32,17,194,76,26,194
    ,160,0,1676
F6  310 DATA 177,29,201,32,208,8
    ,169,29,32,180,192,76,246,19
    3,41,128,1941
75  320 DATA 240,16,205,82,195,2
    40,24,141,82,195,169,18,32,1
    80,192,76,2087
84  330 DATA 175,193,205,82,195,
    240,8,141,82,195,169,146,32,
    180,192,177,2412
A8  340 DATA 31,41,15,205,83,195
    ,240,14,141,83,195,134,38,17
    0,189,218,1992
09  350 DATA 232,166,38,32,180,1
    92,177,29,41,127,133,38,41,3
    1,197,38,1692
C2  360 DATA 208,8,165,38,24,105
    ,64,76,136,193,165,38,41,96,
    201,96,1654
0A  370 DATA 240,240,165,38,41,6
    4,201,64,208,7,165,38,24,105
    ,32,133,1765
6A  380 DATA 38,165,38,32,180,19
    2,200,204,84,195,240,3,76,12
    8,193,169,2137
A4  390 DATA 40,205,84,195,240,8
    ,169,0,141,82,195,32,180,192
```

```
    ,76,90,1929
D9  400 DATA 193,165,27,208,2,19
    8,28,198,27,96,32,17,194,160
    ,0,177,1722
56  410 DATA 27,240,247,201,17,2
    40,243,32,188,192,169,0,32,1
    80,192,169,2369
FD  420 DATA 0,32,180,192,169,0,
    133,27,169,64,133,28,32,120,
    192,162,1633
91  430 DATA 72,160,0,169,153,32
    ,146,192,169,34,32,146,192,1
    77,27,72,1773
A0  440 DATA 32,188,192,104,240,
    23,32,146,192,202,208,241,17
    7,27,240,237,2481
31  450 DATA 169,34,32,146,192,1
    69,59,32,146,192,76,60,194,1
    69,34,32,1736
7F  460 DATA 146,192,177,27,208,
    198,32,146,192,169,0,32,146,
    192,169,0,2026
F5  470 DATA 32,146,192,165,25,1
    33,45,165,26,133,46,169,147,
    32,210,255,1921
AB  480 DATA 32,51,165,32,89,166
    ,76,116,164,56,32,240,255,13
    8,72,152,1836
20  490 DATA 72,165,199,141,82,1
    95,173,134,2,141,83,195,173,
    33,208,133,2129
2E  500 DATA 31,173,32,208,133,3
    2,169,64,133,26,169,4,133,28
    ,169,0,1504
DE  510 DATA 133,25,133,27,169,2
    32,133,29,169,67,133,30,32,1
    99,192,169,1872
A3  520 DATA 0,133,27,169,216,13
    3,28,169,208,133,29,169,71,1
    33,30,32,1680
5F  530 DATA 199,192,169,9,141,3
    2,208,169,3,141,33,208,169,0
    ,141,134,1948
84  540 DATA 2,170,189,148,195,2
    40,7,32,210,255,232,76,242,1
    94,169,0,2361
5E  550 DATA 133,198,32,228,255,
    201,32,208,249,165,31,141,33
    ,208,165,32,2311
80  560 DATA 141,32,208,173,83,1
    95,141,134,2,173,82,195,133,
    199,169,64,2124
53  570 DATA 133,28,169,4,133,26
    ,169,0,133,27,133,25,169,232
    ,133,29,1543
19  580 DATA 169,7,133,30,32,199
    ,192,169,0,133,25,169,216,13
    3,26,169,1802
83  590 DATA 232,133,29,169,219,
    133,30,32,199,192,104,168,10
    4,170,24,76,2014
91  600 DATA 240,255,0,255,0,0,0
    ,1,1,0,151,53,51,50,56,48,11
    61
58  610 DATA 44,48,48,58,151,53,
    51,50,56,49,44,48,48,58,153,
    34,993
08  620 DATA 147,142,34,59,48,49
    ,50,51,52,53,54,55,56,57,48,
    49,1004
EB  630 DATA 50,51,52,53,32,32,3
    2,32,32,32,32,32,32,32,49,49
    ,624
5B  640 DATA 49,49,49,49,147,13,
    13,32,32,32,32,32,32,32,32,8
    3,708
67  650 DATA 67,82,69,69,78,32,7
    7,65,75,69,82,32,54,52,13,13
    ,929
46  660 DATA 13,13,32,32,67,79,7
    7,77,65,78,68,83,32,65,86,65
    ,932
03  670 DATA 73,76,65,66,76,69,1
    3,13,32,32,40,70,49,41,32,67
    ,814
90  680 DATA 72,65,78,71,69,32,6
    6,79,82,68,69,82,32,67,79,76
    ,1087
9E  690 DATA 79,85,82,13,13,32,3
    2,40,70,51,41,32,67,72,65,78
    ,852
61  700 DATA 71,69,32,66,65,67,7
    5,32,71,82,79,85,78,68,32,67
    ,1039
C4  710 DATA 79,76,79,85,82,13,1
    3,32,32,40,70,53,41,32,77,65
    ,869
CC  720 DATA 75,69,32,66,65,83,7
    3,67,32,80,82,79,71,82,65,77
    ,1098
01  730 DATA 13,13,32,32,40,70,5
    5,41,32,83,72,79,87,32,84,72
    ,837
7D  740 DATA 73,83,32,83,67,82,6
    9,69,78,13,13,32,32,40,70,56
    ,892
81  750 DATA 41,32,69,88,73,84,3
    2,84,79,32,66,65,83,73,67,13
    ,981
7B  760 DATA 13,13,32,32,80,82,6
    9,83,83,32,83,80,65,67,69,32
    ,915
3C  770 DATA 66,65,82,32,84,79,3
    2,66,69,71,73,78,0,0,0,0,797
```

GAME OF THE MONTH

Stifflip & Co.

Stifflip & Co. is a game with a difference. Have Palace Software found the magic formula to give the adventure mass appeal?



In the Spring a young man's fancy, lightly turns to thoughts of cricket, or so the famous misquotation of Tennyson would have us believe. Palace Software have taken this theory to heart and embedded the theme deep inside Stifflip and Co. After all is not the Orb and Sceptre of State symbolic of this most regal of national pastimes?

Although the main theme is set in the despotic atmosphere of a banana republic, the traditional atmosphere of a test match best conjurs up the sense of fair play and gentility that the game demands. Well almost, in this game you must always remember that when the going gets tough, even the stiffest upper lip will curl with rage.

Palace are aware that adventures rarely top the software charts. As always, shoot-em-ups and arcade machine conversions seem to dominate. As a result of this, Stifflip has been beefed up by the addition of cartoon strip graphics and a new style of beat-em-up game to lure the reaction game fans into the more cerebrally stimulating world of adventures. For my money, they have succeeded admirably.

Viscount Sebaston Stifflip and his three comrades epitomise all the qualities that prevailed when the Raj was raging and a nation took tea and cucumber sandwiches while awaiting the second innings of the World Wars. Beneath this veneer of sophisticated *ennui* there were stirrings in the Republic of Banarnia. Count Chameleon was the head of a benign dictatorship which he described in the following way: 'when ze peoples ask for ze right to vote, my answer vill be nein!'

Disatisfied with a mere corner of the globe, Chameleon had a masterplan which would cause the total downfall and capitulation of the British Empire. His scientists were close to completion of a raygun which would cause the world to tremble at its sheer simplicity. No, not the feared Rambo Raygun of the SNAFU Corporation but the Rubbertronic Raygun which would neutralise the starch in wing-collars and stiff upper lips, weaken moral fibres and, worst of all

seriously affect the bounce of a cricket ball.

Stifflip's suspicions were aroused when the entire rubber crop of Banarnia went missing and we join his team at Banarnia's airport where they are greeted by General Moustachic with a demand for airport tax. This is the point at which you learn how easily the locals can be insulted as the screen is peppered with bullets to each incorrect response to the General's demands. Eventually, you find the correct trigger and the adventure begins.

After a little searching you find several useful locations, not least of which is the local bar. The bartender is not very helpful but once you solve a fairly weighty problem he will help you all he can.

Each of the main characters can interact with the game by an ingenious icon system. To change the person currently under control you use the 'While...' icon. This causes a 'Meanwhile' caption to appear and the selected team member appears in the location where you last left them. The



character can now be moved using a simple pop-up icon menu or one of a multitude of actions may be performed.

The country is teaming with Chameleon's henchmen who seem to have a grudge against foreigners. These musclebound mental pigmies wander from location to location and woe betide the unfortunate team member who crosses their path. If the character concerned is not under your immediate control, the relevant character icon gains a speech bubble with a plea for help. Speed is of the essence if the victim is to be saved. Quickly selecting that character you can swing into 'Biff' mode and the fight screen appears.

There are several elements to a fight but the first decision is whether to continue or accept the white feather of a coward and head for a safer place. It would be caddish to flee and the best option is to enter the fray using one of the other three options. The most effective of these is a quick jab below the belt but this is the mark of a bounder and can only be resorted to three times before the celestial umpire steps in and sends your character back to the great pavilion in the sky.

This leaves the right uppercut and left hook as the only real alternatives. In both cases the power and accuracy of the punch is measured in the same way. A rotating boxing glove gradually increases its speed and power as you concentrate on keeping an erratically moving cross in the centre of the targetting screen. When you're quite ready a quick press on the fire button releases an arrow which flies into the target and the blow is landed. The effectiveness is measured on a fairground style 'Test Your Strength', icon at the top left of the screen.

Of course your opponent doesn't take this lying down. You have to watch the right hand side of the screen where the henchman's reaction is monitored. As you concentrate on whacking him with the hardest punch you can muster, a boxing glove on a spring bounces even nearer to the crucial contact point. If the blow is landed before you can react, the punch is registered on your diminishing strength scale and you have to start building up your aborted punch from scratch.

Apart from indulging in fisticuffs, Stifflip and Co. will meet many complex and subtle problems in their search for Chameleon. Each person has special capabilities which means working out who has the sharpest nails for untying ropes, who has specialist skills with equipment and who possesses the necessary tools for the job in hand.

Viscount Stifflip is the team leader though his military record shows him to be a devout coward. The Germans had von Richtofen – we had his counterpart Stifflip, the Yellow Baron.

Little is known of the second member of the team, Colonel R G Bargie. It is rumoured that he was the recipient of the noble order of the GnT on the many occasions when he was called to the Bar. He is also renowned for his belief that a salary provides a means to live beyond, and consequently his chequebooks are now printed on rubberised paper.

The only female agent is Palmyra Primbottom who's not as straightlaced as she may sound. Her experiences in the Girl Guides was good perparation for her later work with the savage tribes of Darkest Surrey. Palmyra is a tough customer but she never forgets her distinguished performance in the Guides where she survived the gruelling deportment classes to become the first non-posthumous recipient of an achievement badge.

Professor Braindeath's achievements in the field of amnesia research were long forgotten when he started researches into producing a device to put the middle back into doughnuts. For the moment the work has been abandoned in favour of the Banarnian expedition's promise of thrills, excitement and lot's of sun. The professor's main claim to fame is that he has been clinically dead for the past ten years.

Palace have taken great pains to make this an adventure with a very broad appeal. I was hooked from the beginning but only time will tell if they've been caught in the slips or if they've succeeded in making a good contact across the boundary of conventional adventures. Perhaps their indecision shows through in the co-release of Barbarian - the Ultimate Warrior which lacks any kind of lasting interest but has an immediate, if brutish, appeal. Watch the demos of Barbarian but come home with Stifflip and Co. — the very best of British ingenuity and programming.

Touchline

***Title:** Stifflip & Co.* ***Supplier:** Palace Software, 275 Pentonville Road, London N1 9NL.* ***Tel:** 01-278 0751.*

***Originality:** 10/10.* ***Playability:** 8/10.* ***Graphics:** 8/10.* ***Value:** 9/10.*

Screen Dump 64

It's always useful to be able to get a hard copy of your on-screen masterpiece. Our Screen Dump program, gives you the opportunity to do just that.

By John Fletcher

A screen dump facility is an exceptionally useful asset to any computer. This simple and easy to use program will add this capability to your Commodore 64/128.

This utility can be used within a Basic program or can be loaded in whenever you need it.

Using the Program

When you wish to run Screen Dump 64, there are two parameters which must be entered.

The first is the starting point of your hi-res screen (usually 8192($ 2000)), a number between zero and 65535 can be entered.

The second parameter is the inverse flag. If you enter zero then the picture will be in normal mode. Any number above zero and below 255 will set the picture in inverse mode.

For example, if you wish to dump a picture at memory location 24576 ($6000) in normal mode, then you should type in the following:

SYS 49152,24576,0

Always switch the printer off and on again before running Screen Dump 64 to clear the buffer. After printing, the cursor will appear. At this point, press RUN/STOP and Restore.

When the screen dump is running, the screen will begin to flash. After this, the printer will start.

Demo Program

Included with the Screen Dump is a demonstration program which will draw a 3D perspective shape and dump it to the printer after it has been drawn.

Another handy routine is also included with the demo which will clear 32 pages of memory i.e. a hi-res screen. Instead of waiting for Basic to do this (which takes two or three minutes) this routine will do the job in a split second.

One parameter is needed for this routine which again is the starting point of the hi-res screen.

For example, to clear a hi-res screen starting at 8192 ($2000) use:

SYS 50000, 8192

Tips

If you wish to dump a character set to the printer and then load your characters into memory at, for instance, 12288($3000), then type:

SYS 49152,12288,0

Screen Dump 64 is meant to dump a hi-res mono screen to the printer, but if you choose your colours carefully, it is possible to dump multi-colour screens to the printer, getting three shades of grey.

If you wish to stop the screen dump at any time press RUN/STOP and Restore.

YC

PROGRAM: CLEAR LOADER

```
84  1 REM ***********************
    ***********
2E  2 REM * THIS PROGRAM POKES T
    HE HI-RES *
4A  3 REM * CLEAR ROUTINE INTO M
    EMORY.    *
81  4 REM ***********************
    ***********
06  10 BL=2    :LN=50    :SA=5000
    0
```

```
5B  20 FOR L=0 TO BL:CX=0:FOR D=
    0 TO 15:READ A:CX=CX+A:POKE
    SA+L*16+D,A:NEXT D
A5  30 READ A:IF A><CX THENPRINT
    "ERROR IN LINE";LN+(L*10):ST
    OP
40  40 NEXT L:END
53  50 DATA 32,253,174,32,138,17
    3,32,247,183,165,20,133,251,
    165,21,133,2152
AA  60 DATA 252,160,0,162,32,169
    ,0,145,251,200,208,251,230,2
    52,202,208,2722
05  70 DATA 246,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,246
```

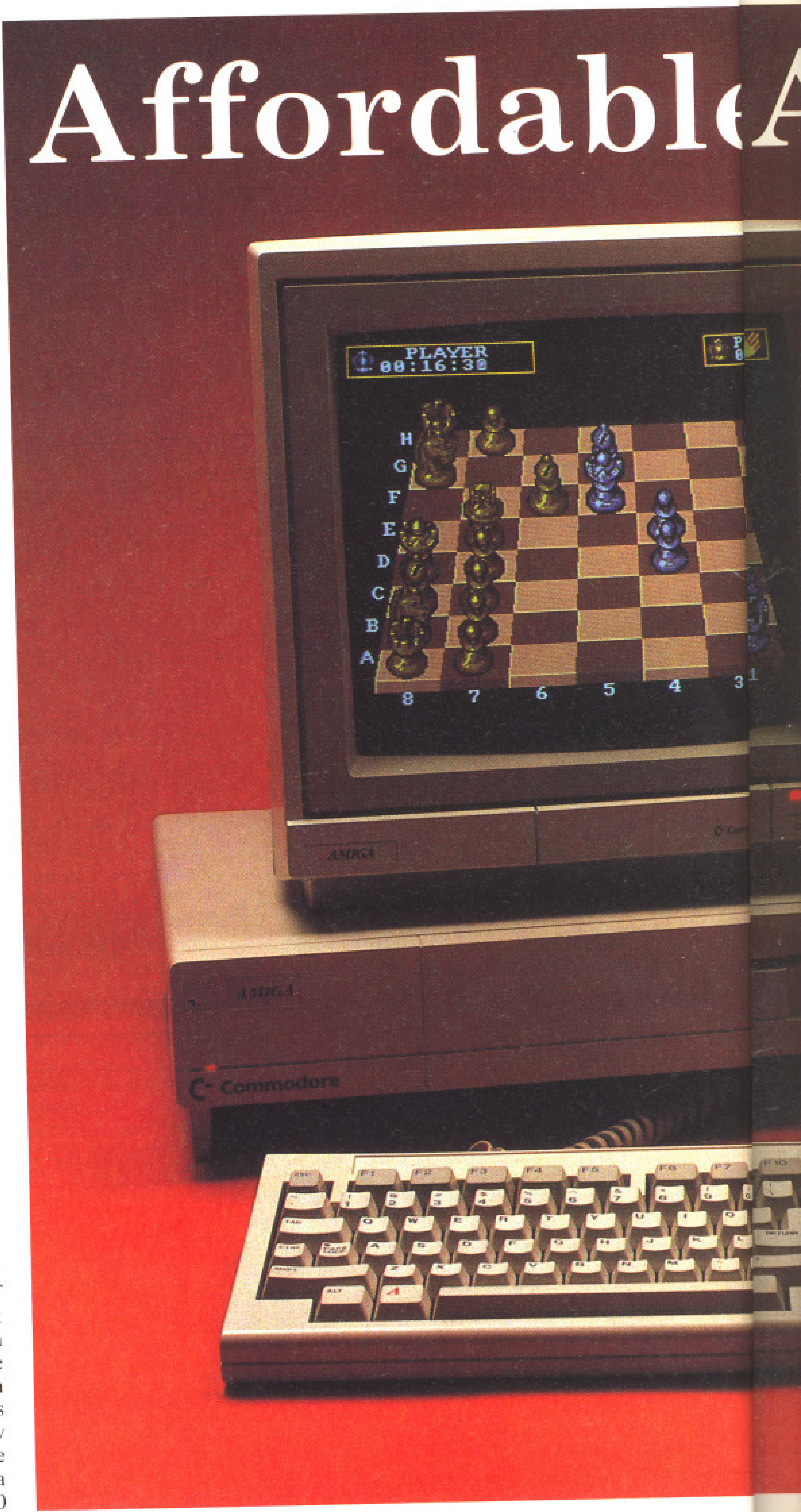
PROGRAM: SCREEN DUMP LOAD

```
84  1 REM ***********************
    ***********
F1  2 REM * THIS PROGRAM POKES T
    HE CODE    *
5B  3 REM * FOR THE C64 SCREEN D
    UMP PROG  *
24  4 REM * INTO MEMORY.
              *
80  5 REM ***********************
    ***********
2F  10 BL=34    :LN=50    :SA=4915
    2
5B  20 FOR L=0 TO BL:CX=0:FOR D=
    0 TO 15:READ A:CX=CX+A:POKE
    SA+L*16+D,A:NEXT D
A5  30 READ A:IF A><CX THENPRINT
    "ERROR IN LINE";LN+(L*10):ST
    OP
40  40 NEXT L:END
E4  50 DATA 32,253,174,32,235,18
    3,165,20,141,238,193,165,21,
    141,239,193,2425
23  60 DATA 142,249,193,169,21,1
    41,24,208,169,27,141,17,208,
    173,32,208,2122
83  70 DATA 141,132,3,173,33,208
    ,141,133,3,32,159,193,32,66,
    192,32,1673
70  80 DATA 232,192,32,102,192,1
    73,132,3,141,32,208,173,133,
    3,141,33,1922
4F  90 DATA 208,96,169,0,32,189,
    255,169,4,162,4,160,255,32,1
    86,255,2176
6B  100 DATA 32,192,255,162,4,32
    ,201,255,169,13,32,210,255,1
    69,8,32,2021
B0  110 DATA 210,255,32,110,193,
    96,32,110,193,169,13,32,210,
    255,32,174,2116
FF  120 DATA 255,32,171,255,169,
    4,32,195,255,96,173,238,193,
    174,239,193,2674
62  130 DATA 133,251,134,252,24,
    173,241,193,41,7,141,242,193
    ,169,0,141,2335
51  140 DATA 244,193,173,240,193
    ,141,243,193,24,162,3,234,23
    4,46,243,193,2759
5A  150 DATA 46,244,193,202,208,
    247,24,165,251,109,242,193,1
    33,251,165,252,2925
CE  160 DATA 105,0,133,252,24,16
    5,251,109,243,193,133,251,16
    5,252,109,244,2629
AB  170 DATA 193,133,252,173,241
    ,193,74,74,41,254,170,24,165
    ,251,125,188,2551
D3  180 DATA 193,133,251,165,252
    ,125,189,193,133,252,24,96,2
    34,234,234,234,2942
55  190 DATA 234,234,234,234,234
    ,234,234,234,169,0,141,248,1
    93,141,246,193,3203
E2  200 DATA 141,240,193,169,128
    ,141,247,193,173,246,193,141
    ,241,193,32,122,2793
FA  210 DATA 192,169,0,141,245,1
    93,160,0,177,251,45,247,193,
    240,5,169,2427
CE  220 DATA 64,141,245,193,32,1
    31,193,238,241,193,77,241,19
    3,141,32,208,2563
3E  230 DATA 141,33,208,238,255,
    207,56,173,241,193,237,246,1
    93,201,7,208,2837
93  240 DATA 205,32,95,193,24,11
    0,247,193,208,8,238,240,193,
    169,128,141,2424
78  250 DATA 247,193,173,240,193
    ,201,40,208,175,169,0,141,24
    0,193.32,110,2555
47  260 DATA 193,24,173,246,193,
    105,7,141,246,193,201,196,20
    8,154,96,24,2400
FE  270 DATA 173,248,193,9,128,3
    2,210,255,169,0,141,248,193,
    96,169,13,2277
1E  280 DATA 32,210,255,169,16,3
    2,210,255,169,49,32,210,255,
    169,54,32,2149
2F  290 DATA 210,255,96,173,249,
    193,240,8,173,245,193,73,64,
    141,245,193,2751
B2  300 DATA 24,110,248,193,24,1
    73,248,193,109,245,193,141,2
    48,193,96,169,2607
7D  310 DATA 1,141,134,2,169,147
    ,32,210,255,169,14,32,210,25
    5,162,0,1933
2A  320 DATA 189,250,193,157,224
    ,5,232,224,40,208,245,96,64,
    1,128,2,2258
5C  330 DATA 192,3,0,5,64,6,128,
    7,192,8,0,10,64,11,128,12,83
    0
C1  340 DATA 192,13,0,15,64,16,1
    28,17,192,18,0,20,64,21,128,
    22,910
C0  350 DATA 192,23,0,25,64,26,1
    28,27,192,28,0,30,64,31,0,32
    ,862
28  360 DATA 0,0,0,0,0,0,0,0,0,0
    ,45,32,67,82,69,65,360
83  370 DATA 84,69,68,32,66,89,3
    2,74,79,72,78,32,38,32,68,65
    ,978
74  380 DATA 82,82,69,78,32,73,7
    8,32,40,67,41,32,49,57,56,54
    ,922
C6  390 DATA 32,45,27,24,25,30,3
    1,28,29,18,19,16,17,22,23,0,
    386
```

PROGRAM: DEMO PROG

```
AE  100 PRINT"[CLR]"
BF  110 POKE53265,PEEK(53265)OR3
    2
8E  120 POKE53272,PEEK(53272)OR8
DB  130 FORI=0TO999:POKE1024+I,1
    4:NEXT
B6  140 :
9D  150 REM ******************
86  160 REM ** CLEAR SCREEN **
26  170 REM ** STARTING AT   **
6E  180 REM ** 8192 ($2000) **
85  190 REM ******************
F2  200 :
89  210 SYS 50000,8192
E6  220 :
2D  230 REM ******************
2D  240 REM ** WORK OUT THE **
58  250 REM ** EQUATION FOR **
B0  260 REM ** PLOTING THE   **
7B  270 REM ** NEXT PIXEL.   **
46  280 REM ******************
19  290 :
19  300 K=[PI]/1400
D3  310 M=1/SQR(2)
EC  320 DEF FNA(Z)=10*COS(K*(XP*
    XP+YP*YP))
B5  330 FORXP=-100TO100
4F  340 Y1=5*INT(SQR(10000-XP*XP
    )/5)
AB  350 FORYP=Y1TO-Y1 STEP -5
F6  360 Z=FNA(SQR(XP*XP+YP*YP))-
    1.2*YP
06  370 IFYP=Y1THEN390
89  380 IFZ<Z1THEN530
7E  390 X=160+XP:Y=100-INT(Z/2)
AB  400 :
E8  410 REM ******************
AD  420 REM ** SCALE THE     **
7A  430 REM ** CO-ORDINATES **
A4  440 REM ** FOR PLOTTING **
EE  450 REM ** THE PIXEL ON **
77  460 REM ** THE SCREEN.   **
DC  470 REM ******************
DB  480 :
2E  490 ROW=INT(Y/8):COL=INT(X/8
    )
62  500 LINE=YAND7:BIT=7-(XAND7)
FF  510 ADDR=8192+ROW*320+COL*8+
    LINE
E3  520 POKEADDR,PEEK(ADDR)OR2¼B
    IT
27  530 Z1=Z
54  540 NEXT:NEXT
12  550 :
41  560 REM ******************
7F  570 REM ** SCREEN DUMP   **
3A  580 REM ** STARTING AT   **
D2  590 REM ** 8192 ($2000) **
A9  600 REM ******************
5E  610 :
CF  620 SYS 49152,8192,0
```

Affordabl A



The Amiga A500 will certainly put the cat amongst the pigeons in the 68000 market. It's rather like a Rolls Royce being offered at a price slightly higher than the average family saloon. At £499 + VAT, the Amiga now competes favourably with the top end of the present home computer market. The only obstacle is the Atari ST and whether the home buyer will go for a saving of around £100. In many ways the Amiga is superior to the ST but will people look beyond the price tag?

So, what do you get for your money? The A500 is an Amiga in every sense and the inclusion of the boot program, Kickstart, in the ROM saves a few of the setting-up headaches which were part and parcel of the earlier A1000. A few more of the teething troubles inherent with the Workbench software have also been ironed out with Workbench II.

The amazing thing about A500 is its size and weight. Considering there is a built in disk drive, it is still a very light unit and takes up just slightly more space on my workstation than the C128. The finish is the now standard cream coloured plastic which seems to be Commodore's industry standard. At least this encourages cleanliness because the finish really does show every speck of grime.

Cut-down

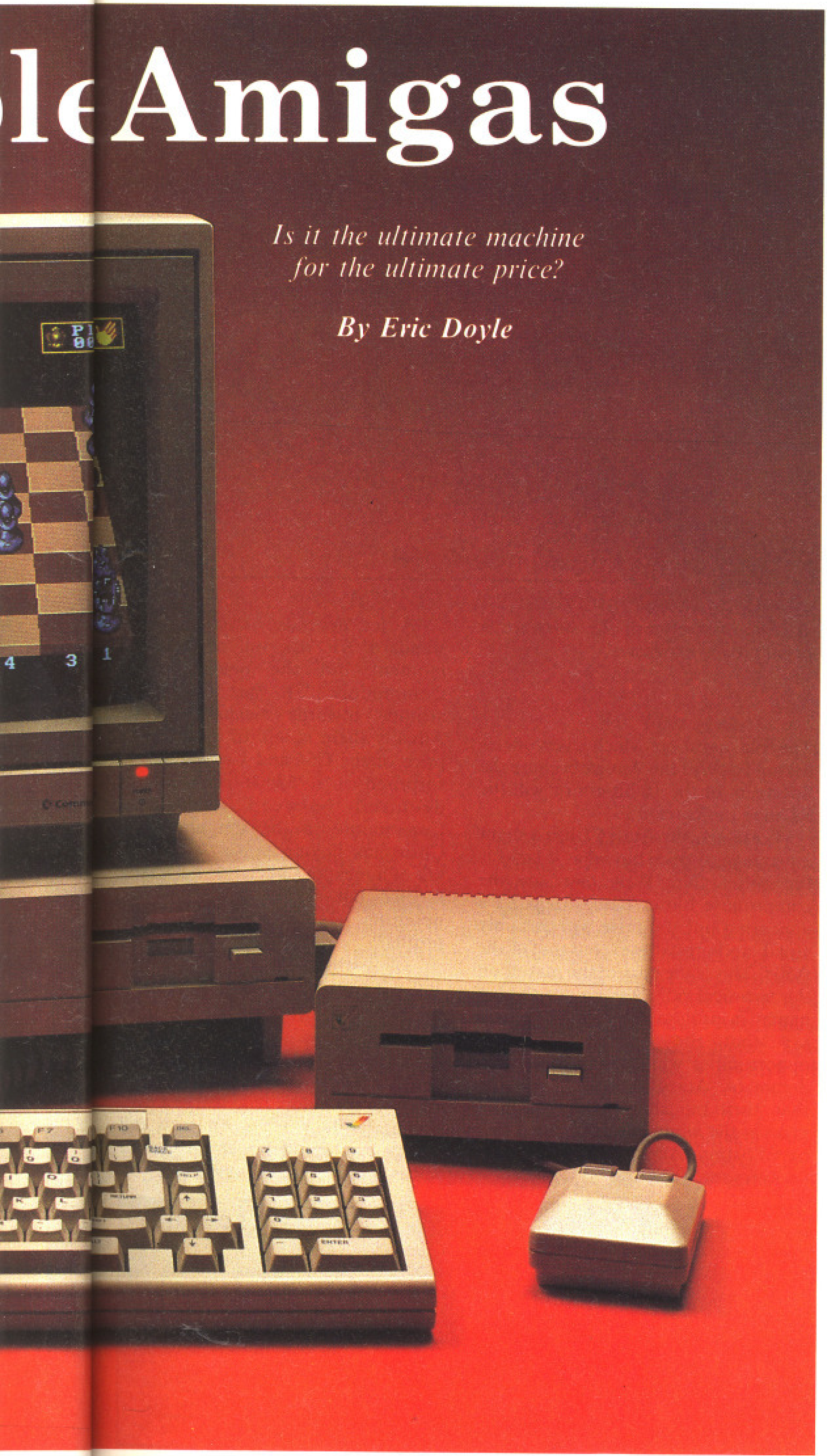
Although the Amiga is at a cut-down price, there are no compromises on the features offered in the Amiga standard as set up by the A1000. I have tried every bit of software to hand and so far nothing has failed to load. Perhaps its time that software houses started to indicate memory requirements for their products because the future will bring bigger and better products which may not fit into the standard memory.

The rear of the machine is reserved for input and output ports. The only colour video output is for RGB monitors but a monochrome composite output has been tapped off for those who intend to use it for text based businessware on a green screen VDU. This is rather like running the aforementioned Rolls Royce on paraffin but a useful stopgap if funds don't immediately stretch to a new monitor. There is a RF unit available to allow the use of the machine with a domestic TV set but, as with all 80

le Amigas

Is it the ultimate machine for the ultimate price?

By Eric Doyle



column systems, this is not the recommended method of viewing the Amiga and is only provided because of public demand for such refinements.

Up to four external disk drives can be controlled via the single disk output port. As with all Commodore drives, they are not the fastest of units and do tend to emit worrying grinding noises. One advantage of external drives is that you can take advantage of emulators (CP/M, PC-DOS etc). You are then free to use drives other than the usual 3.5 inch drives but I could find no simple way to select an external drive as the main drive which could give problems with some commercial software.

Printers, modems and all of the other paraphernalia of hi-tech living can be connected to either the parallel or serial connectors. As the range of add-ons increases I hope some enterprising outfit produce a motherboard to prevent all of the plugging and unplugging which I forsee in future years.

Sound Capabilities

The Amiga's sound capabilities are first class and a MIDI interface will mean that the portable A500 may well be appearing on Top of the Pops before too long. To ensure the best fidelity there is a pair of stereo output sockets which can either connect to a stereo monitor or plug directly into your music system for even higher fidelity.

The final ports are possibly the ones which will take the heaviest wear and tear: the control ports. This is where trackerballs, mouses and joysticks can be connected. There are two ports available which resemble the ports on the humble C64 so there will be no shortage of choice when selecting your control devices. The A500 package includes a mouse which is essential for interacting with the Intuition operating system.

We have been praising the abilities of the Amiga in Your Amiga, our bi-monthly magazine within a magazine, so I recommend that you brush up on your back issues for greater detail. The first package I would recommend is Deluxe Paint II which will show off the graphics capability of your new machine to full advantage as well as providing hours of enjoyment. This must be the best art program currently available.



Prices

The subject of software prices is also one to be considered. Most packages cost in excess of £20 which is not cheap though you do get your money's worth in terms of software development time. The big problem is that the software should not be bought 'blind'. At the moment most retailers are more than happy to give demonstrations but will this be the case as the Amiga becomes part of the furniture in more and more homes? Your Amiga will point you in the right direction but hands on experience is the greatest recommendation that a package can get so now is the time to befriend a local retailer.

Budget companies like Mastertronic, Code Masters and Firebird are waiting in the wings and there are strong rumours of games at £9. This would provide a fantastic boost to the hardware sales for home use. After all, what use is a state-of-the-art computer at a popular price if the software is prohibitively expensive?

Big Question

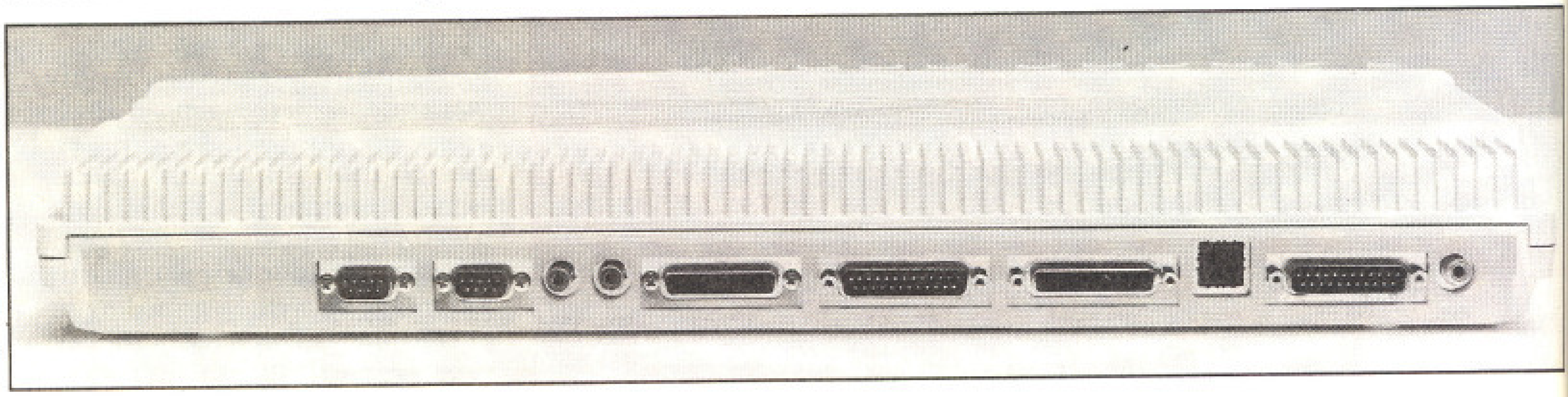
The big question which everyone is asking is, 'Will the Amiga become the Spectrum of the 16 bit era or will the ST take the laurels.'

Certainly, the Atari ST has a slight advantage of price but what it lacks is the blitter chip. Well, there are the compromise blitter based Mega ST's appearing but the price will certainly equal, and probably exceed that of the A500. This is the crux of the matter on the technical side. Ask any of the big names in programming and they will say that the Amiga opens up opportunities which the ST can only dream of. Atari seem to have more than their fair share of the popular press at the moment but I predict that by Christmas Amiga will be the word on everyone's lips.

A lot depends on pricing. The standard ST has the edge at the moment but the new head of Commodore UK has a positive attitude towards machine costing. Already there is talk of reducing the price of the C64 and I would not be surprised if a 68000 price war is declared between Atari and Commodore in the run up to the Christmas buying bonanza. A price tag of a meagre £500 could fall a little further but will Commodore risk upsetting retailers by reducing their profits?

The battle is for the 16 bit market and whoever gets their foot firmly in the door will benefit greatly from future benefits.

Even Acorn realise this with their risky 16 bit project. The Atari/Commodore feud will be a hard fought battle but the Amiga is still THE machine and should win on merit but is this enough? I hope so. YC



The ICPUG Column

We present the first column in a regular series by ICPUG – Britain's biggest independent Commodore user group.

By Tim Arnot

Since this is the first ICPUG column to appear in Your Commodore, it might be a good idea to start off by introducing ourselves. ICPUG (pronounced 'ickpug') is an acronym for the Independent Commodore Products Users Group. With me so far? Good. Hands up those of you who have seen our adverts in this and previous isues. Even better! Splendid! I am almost tempted not to say any more about ourselves, but as one Mr Spock so nearly once said 'The ignorance of the few outweighs the needs of the many.' So put your hands down, get comfortable, and I'll begin.

How It all Began

ICPUG started out back in the dim mists of time when computers were big, drives were rare and lK was a lot of memory! In those days (1979 actually) £800 would just about buy an 8K PET with built-in cassette (see, Amstrad had nothing new there) and 9" integral monitor. Some people in the south east corner of England got together and formed the Independent PET User Group (IPUG), life was rosy, the group flourished and it had about 400 members.

Gradually, PETs got bigger. 8K gave way to 16K, which gave way in turn to 32K. Basic 2.0 was replaced by Basic 4.0. Then PETs got fatter, developed a business keyboard and 80 column screen, got bigger again, memory soared to a massive 96K through the innovative technique of bank switching.

In 1982 a new computer arrived on the scene. It had a massive 3.5K of memory, the phenomenal and unsurpassed Basic 2.0 and a huge 22 column screen. But it was in colour, and for a mere £200 it was a bargain. Yes, the VIC-20 was born. A year later and Commodore tried again, producing the best-selling 64. It had a 40 column screen, the same archaic Basic 2.0, high resolution graphics and sound that nobody could get at, but nearly 5 years later, and after one face lift, it is still one of the best 8-bit computers around.

Where We Came In

ICPUG had a problem. Membership was now in the thousands, but the vast majority had VICs and 64s - not PETs. So a change of name was in order, and 'PET' was dropped in favour of 'Commodore Products'. (Incidentally, TPUG in Canada, of which Jim Butterfield is a founding mamber, has stuck with the PET label throughout their history). ICPUG was born.

After that, Jack Tramiel left Commodore to buy Atari, and as his passing shot, launched the Plus/4 and C-16 into the world. The following year, in a desperate bid to make up for this disaster, Commodore finally brought out the machine it had originally intended to launch before - namely the 128.

During the bad times of 1985, employees left Commodore like rats from a sinking ship (except that rats usually leave voluntarily), and more than one manufacturing plant was closed down. Rumour and counter-

rumour abounded; new machines; chapter 11 (bankruptcy to us non-Americans)...until finally the revolutionary Amiga 1000 arrived. A business computer that businesses didn't want and enthusiasts couldn't afford, but the potential was awesome. Commodore didn't go bust, although the Amiga had fierce competition in the form of the already available and cheaper Atari ST. And now? More Amigas and hoards of even cheaper Sts. The war continues.

From Strength to Strength

But what of ICPUG? Throughout this, ICPUG has just grown and grown, and this year, membership is expected to exceed the 4000 mark for the first time ever. For the statistically curious, that makes ICPUG the largest wholly-amateur organisation in Europe. And with an annual turnover exceeding £50,000, it is not surprising that last year we elected to become a limited liability co-operative. Yes, folks, the name has changed yet again, and ICPUG became ICPUL - mainly thanks to some obscure law that says a 'group' must be a group of companies'. However we still trade under the name ICPUG.

Why the success? Well, our membership is based firmly on serious users' rather than 'games players' (not that we are averse to playing the odd game - far from it!). Our newsletter ('journal' really since it contains a similar amount of text to Your Commodore) is one of the most authoritative documents available on Commodore machines. It has been said that ICPUG reacts to technical information like a hoover reacts to crumbs.

This is undoubtedly true, and is a major reason for our success. Why? Because Commodore in their infinite wisdom have chosen to shed 99% of their technical staff, and now we are the only people who know anything about what they sell. So when Joe Punter phones Commodore with a query, who does he get put onto? That's right - us!

Joining Up

So, now you know who we are and why we are here. If you want to join, check our the advertisement elsewhere in this issue. If not, I'll just leave you with the thought that it was probably the best £11 you would have spent (?) I didn't get around to saying who I am and how come I'm writing this – such is life. Next time: Jim Butterfield and we got on at the Commodore show.

See you on the bit stream.

For more information on ICPUG contact:

Jack B. Cohen
Membership Secretary,
30 Brancaster Road,
Newbury Park,
Ilford,
Essex IG2 7EP

One year's subscription to ICP.UG: £10.

YC

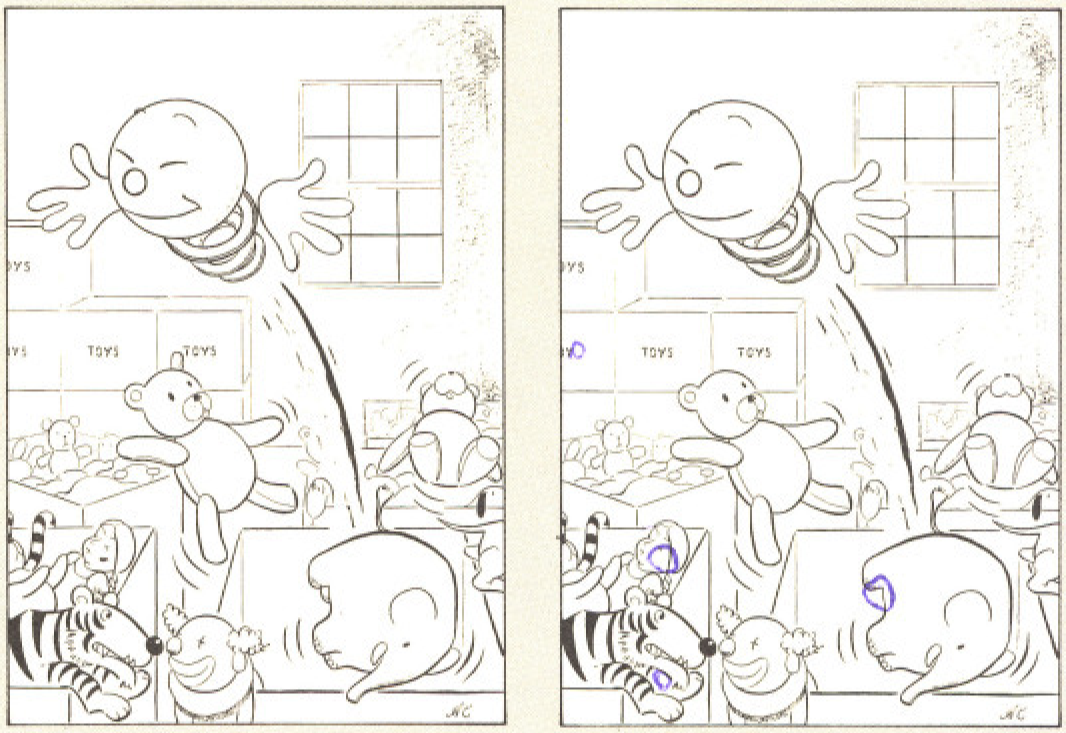
Thing Bounces Back



Your chance to win one of 20 copies of the long awaited Thing Bounces Back from Gremlin Graphics.

Having dealt finally with the evil toy goblin in Thing on a Spring, Thing must take up his second challenge and halt production of evil toys in the factory. To do this he must collect parts of a program that are scattered around the factory in order to re-program the factory computer.

Twenty copies of Thing Bounces Back are up for grabs in this month's competition. Just find the differences and a copy of the program could be bouncing its way to you.



How to Enter

Study the two cartoons, there are a number of differences between them. Once you have decided how many differences there are complete the entry coupon and send it to the editorial address (see below). Please write the number of differences that you have found on the back of the envelope. If you don't then your entry will not be accepted.

The Rules

Entries will not be accepted from employees of Argus Specialist Publications and Gremlin Graphics Software. This restriction also applies to employees' families and agents of the companies.

The How to Enter section forms part of the rules. The Editor's decision is final and no correspondence will be entered into.

Thing Competition

Entry Coupon

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Post to: *Your Commodore,* Thing Competition, 1 Golden Square, London W1R 3AB. Closing date: Friday, 28th August, 1987.

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REPORT ON FINDINGS

Action Replay Mk III is more powerful, more friendly and will back up more programs than any competing utility by taking a 'Snapshot' of the program in memory so it doesn't matter how it was loaded... from disk or tape, at normal or turbo speeds... the results are the same – **Perfect!! Amazing!!!**

STARBASE UPDATE

- Simple to use: just press the button and make a complete backup: Tape to Tape, Tape to Disk, Disk to Disk, Disk to Tape. – THE PROCESS IS AUTOMATIC – JUST GIVE THE BACKUP A NAME.
- All backups will reload at turbo speed independently of the cartridge.
- Dual speed tape turbo system. Programs can load up to 3 times faster than commercial turbos – that's over 10 times normal Commodore speed.
- Freeze the action then view the program with the monitor feature. Add pokes for infinite lives etc. Then restart the game or backup – ideal for customised versions of your games.
- Picture Save. Save any multi-colour. Hires screen to disk or tape. Compatible with Blazing Paddles, Koala, Slideshow etc.
- Fully compatible with 1541, 1541C, 1570, 1571, and ehancer or any CBM compatible data recorder.
- For C64, 64C, 128, 128D (in 64 mode).
- Unique Sprite Monitor. Freeze the Action and view all the Sprites, watch the animations scroll across the screen. Save Sprites to disk or tape. Customise your games by loading sprites from one game to another – then restart the program or make a backup.
- Compatible with fast DOS and Turbo ROM systems.
- Backup process in turbo speed – faster than any rivals.
- Special compacting techniques. Each program is saved as a single file.
- Transfers multistage tape programs to disk – more than any other cartridge – even the extra stages are turbo load – a unique feature.
- Sprite Killer! make yourself indestructible by disabling Sprite collisions in games.
- Fast disk format (20 secs).
- Built-in unstoppable reset button.



PLUS Built In FASTLOADER

Action Replay III even has a built in disk fast loader which speeds up loading 5 times. Uses no memory – invisible to the system. You could pay £20 alone for this feature.

WARP 25 BREAKS THROUGH THE 10 SECOND BARRIER!

Action Replay III now comes with an amazing new Disk Bootloader that will reload your backups at TWENTY FIVE TIMES normal speed. The fastest disk turbo yet devised!! There are NO CATCHES. WARP*25 works with ALL your games. Works with any disk drive. No preload required – No hardware modifications necessary – No user knowledge required – programs load INDEPENDENTLY. LOADING TIME – 9.8 SECONDS (for a typical game saved by WARP*25 in conjunction with ACTION REPLAY III). This time is for the COMPLETE load process from start to finish. Reload is entirely INDEPENDENT of the cartridge or any other hardware.

Compare these (accurate!) figures for some rival backup systems:

SYSTEM	LOAD TIME	PROGRAMS PER DISK	CARTRIDGE REQUIRED?
ACTION REPLAY MK III SAVED WITH NORMAL TURBO	25 SECS	THREE	NO
ACTION REPLAY MK III SAVED WITH WARP • 25	9.8 SECS	THREE	NO
FREEZE FRAME (MK IV)	40 SECS	TWO OR THREE	NO
FREEZE FRAME (LAZER)	25 SECS	TWO	YES
EXPERT SYSTEM	30 SECS	THREE	NO

All purchasers of Action Replay III will receive WARP*25 FREE with their cartridge. Existing Action Replay III owners can obtain WARP*25 Disk turbo by sending £2.50. post free. (No need to send your cartridge). OR obtain it FREE on the Enhancement Disk (£7.95).

THE ACTION REPLAY ENHANCEMENT DISK

The best collection of tape to disk transfer routines for nonstandard multiload programs (eg Dragons Lair I and II, Championship Wrestling, Summer Games, Ace of Aces, Gauntlet, Supercycle, Marble Madness, World Games). 31 titles in all. Uses our unique parameter system. No user knowledge required. Turboload throughout. NOTE: Standard cartridge transfers normal multiloaders eg Winter Games etc. etc. Disk includes file copy and disk backup utilities.
PRICE £7.95 with FREE! Multicolour Slideshow for display of loading screens, hires pictures etc. saved by Action Replay. Great entertainment!

PERFORMANCE GUARANTEE

100% Success? Rival Claims? Who's Kidding Who?
Action Replay Mk III will backup any program which any other cartridge can backup – and more! It also has an unmatchable range of features. Consider 'Freeze-Frame' for example, which uses more disk space, saves at slower speed, has slower tape loader, has no built in disk fastloader, no picture, Sprite or restart features and costs £10 more than Action Replay. So who's kidding who? Buy Action Replay Mk III. If you find that it does not live up to our claims return it within 7 days of receipt and your money will be refunded.

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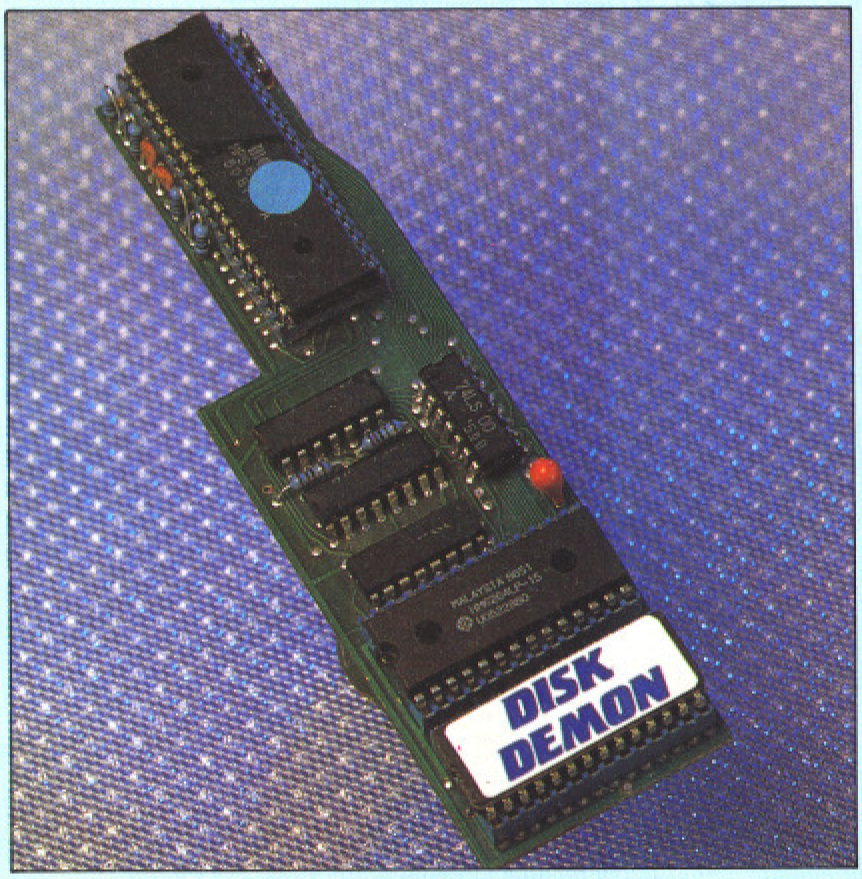
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PLUS AN ADVANCED COMMAND STRUCTURE INCLUDING:

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- ❑ 16 function keys: list, run, load, directory, format, save, old, verify, etc.
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- ❑ Number conversion. ❑ Reset.
- ❑ Unique built in file copier will copy files up to 250 blocks like lightning – multiple copy options – perfect for copying Action Replay files.
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- FAST COPY: Copy a disk in under 2 minutes.
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❑ SINGLE 1571 DRIVE (64 OR 128 MODE)

- FAST COPY: Entire 1571 disk in under 1 minute.
- SINGLE OR BOTH SIDES: Will copy C64 or true 128 software.
- C64 or 12 modes.

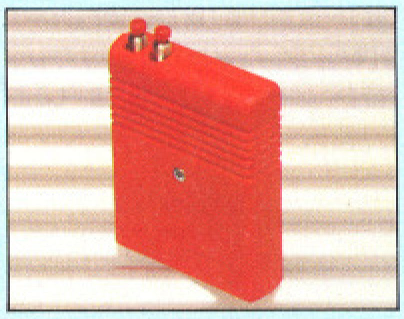
❑ 1541 PARAMETERS MODULE

This is the module that gives Fast Hack'em its power. The parameters module contains dozens of "Parameter Keys" that are used to unlock those heavily protected programs. Each parameter is designed for a particular software brand or even a particular program. Other copy programs may make strong claims, but without special parameters they just can't cope. Datel will be offering updates to Fast Hack'em on a quarterly basis, featuring 20-50 new parameters plus other improvements as they're made. Prices to be £6 plus old disk.

❑ 1541 PARAMETERS MODULE

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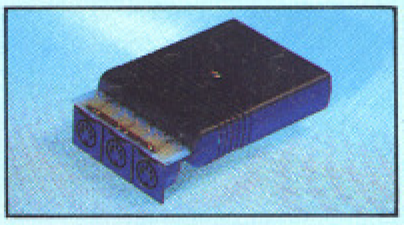
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The Disk Utility Cartridge

- ❑ Disk fastload cartridge.
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- ❑ Fast save. ❑ Fast format (10 secs).
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- ❑ Plus a full machine code monitor – too many features to list but it has them all!
- ❑ Special switching techniques make Diskmate invisible to the system. Therefore it is a more compatible fastloader than other types.
- ❑ Diskmate II is £14.99.

Special Offer!!

Diskmate II can be purchased on the same cartridge as Action Replay II for **ONLY £39.99**



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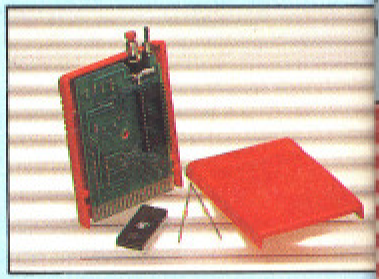
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- ❑ CBM 64/128 mouse.
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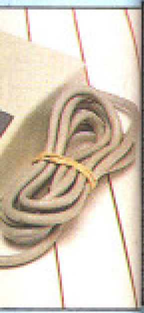
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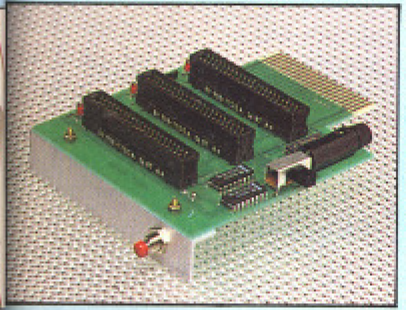
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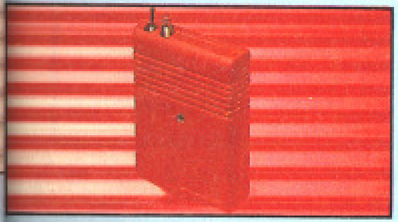
- ❑ Accepts 3 cartridges.
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- ❑ Battery backed to last up to 5 years (lithium battery).
- ❑ Simply load the program you require – then flick the switch. The cartridge can then be removed just like a ROM cartridge.
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- ❑ Choose any set at the flick of a switch.

"For anyone who uses their printer often this chip is a must. It's quick and easy to use and the end results are impressive" – Your Commodore, Jan 87.

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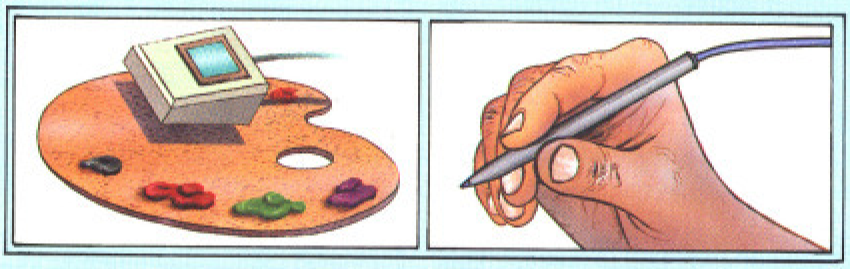


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Turbo Rom II is a replacement for the actual kernal inside your 64. It provides superfast load/save routines.

- ❑ Loads most programs at 5-6 times normal speed.
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- ❑ Improved DOS support including 10 sec format.
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- ❑ FCOPY – 250 block file copier.
- ❑ FLOAD – special I/O loader.
- ❑ Plus lots more.
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A complete lightpen/graphics illustrator package.

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Contributions

So you own a Commodore? So you've written some programs? So why haven't you sent them to us?

Your Commodore is always on the look out for new programs, hints and tips, articles and even regular series. In fact if you have something that you think could be of use to other Commodore owners we want to hear about it.

So if you have got something which you think we may be interested in. How do you go about submitting it to us?

Below you will find a list of guidelines that will help us to deal with any item that you send in to us. We don't expect everybody to be the next William Shakespeare but if you do follow these simple rules then it will make our job a lot easier.

1) If possible all material sent to the magazine should be typed or printed out on a computer printer.

2) All text should be double spaced i.e. there should be a blank line between each line of text. You should also leave a margin of about 10 characters around the text.

3) On the very first page you should put the following:
Name of the article
Machine that it is for
Any extras required – disk, printer etc.
Your name
Your address
Your telephone number

4) The top of every page should have the following information on it:
Abbreviation of the article title
Your name
The page number

For example, suppose you had submitted an article on C64 interrupts. You should put something like the following at the head of the page:

Interrupts/J.Smith/1

5) Please make sure that you do not make any additional marks on your text especially underlining.

6) Try and write in clear concise English, it does not have to be a work of literature but it must be comprehensible.

7) On the bottom of each page you should put the word MORE if there are more pages to the article or ENDS if it is the last page.

8) If possible, enclose a listing of all programs.

9) Under no circumstances use a staple to hold the pages together. Use a paperclip instead.

10) Programs should be included on either disk or tape. Make sure that you SAVE two copies of every program so that we have a better chance of loading them if problems occur.

11) Programs under 10 lines can be included in the text. If your program is longer than this you must enclose a disk or cassette.

12) If your article needs any artwork then supply clear examples of what is needed. We don't expect you to be an artist but we do need to see what is required.

13) Photographs, if necessary, must be either black and white prints or colour slides. We can take shots ourselves so don't worry about this too much.

14) Submissions of any length are welcome. If you have a five line routine that you think may be of use to someone else we welcome it just as much as a full blown six part series.

15) Payment varies quite a lot and depends on quite a number of factors, such as complexity of program, presentation of program, number of magazine pages it takes up etc. Payment is generally between £10.00 and £800.00.

16) All payments are made in the month that the magazine containing your article has appeared in print.

17) If we do find your submission suitable for inclusion in the magazine we will write to you giving the terms of publication, the rate of payment and an agreement form. Prompt return of this form will allow us to use your program as soon as possible.

18) If you want the program returning to you, should we find it unsuitable for publication, then you should enclose a stamped self addressed envelope.

19) The last and most important point to make is 'get writing', we are waiting for your articles.

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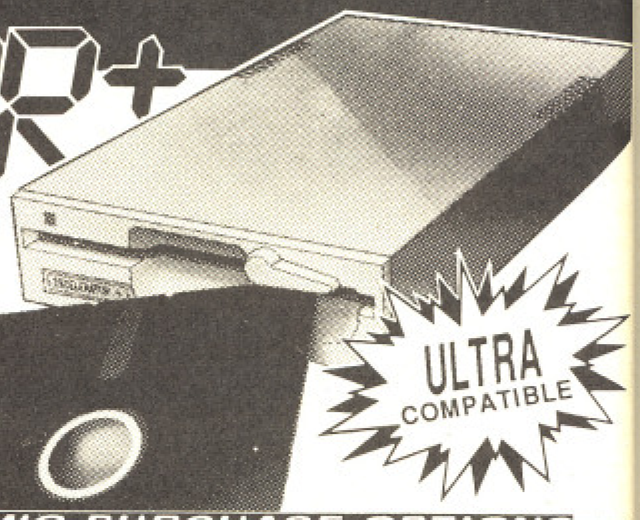
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The speed and efficiency is **incredible**, who would believe that the humble old 1541 could load **202 blocks in less than 5 secs**. It is compatible with the majority of commercial software and can be switched out when necessary. One of the real pleasures of using this system is to use it with the likes of Easyscript & Superbase to speed up both the **normal loading and the sequential files**. It is important to point out that this is achieved using **standard** CBM disk format and not a special system, therefore you can still use your existing disks.

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INSTALLATION

Fitting involves fitting two sub assembly boards, one in the 64/128 and one in the 1541. Normally these just plug in but some '64s need a small amount of soldering.

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Knowledge Made Simple?

XPER is a new package that finally brings the Expert System to the C64. Can it do anything for you?

By Fin Fahey

XPER from Abacus Software, is an 'Expert System', aka 'Knowledge-Based System', aka a 'Michie' – named after the developer and guru of Knowledge Engineering, Donald Michie. It claims to be the first of its kind available for the humble Commodore, but how useful will it be?

It is at least pleasant for C64/128 owners to be let in on such a widely mystified form of software. Knowledge Engineering swings in and out of fashion and seems to engender passionately partisan reactions.

Readers of the New Scientist may have noticed that worthy journal is in the throes of backlash against the whole idea. Considering the extravagant claims made by some of the most wild-eyed advocates of KBSs, this is at least understandable.

What Is It?

So what is an Expert System and why the fuss? Well, in a sense it's a response to the usual world shortage of experts (Educate more? Too simple...) Just as an industrial robot is a device to capture, replicate, and reuse the manual skills of the assembly line or craft worker, so the Expert System seeks to do the same for some intellectual skills — those we generally think of as knowledge.

Any such system, such as XPER, holds knowledge in the form of a set of 'learned' rules – the knowledge base creator abstracts these out from their own fields of study or experience. The simplest example, which Abacus use in their sample XPER knowledge base, may be that of zoology.

Playing by the Rules

A trained zoologist will immediately be able to identify an unknown animal by applying a series of classificatory rules based on its appearance, behaviour or whatever. As these rules are applied one by one, the number of alternatives is narrowed, eventually, with luck, to just one.

Which may seem obvious – after all, it's what many of us do all the time, for example while diagnosing a car fault, or debugging a program — "It's not this — so it must be that...".

The point, though, of the Expert System is that it may contain sets of rules we don't carry ourselves, so it's just like having an unpaid expert on tap all the time. Which is a prospect that makes some experts, understandably, nervous.

Great XPEctations

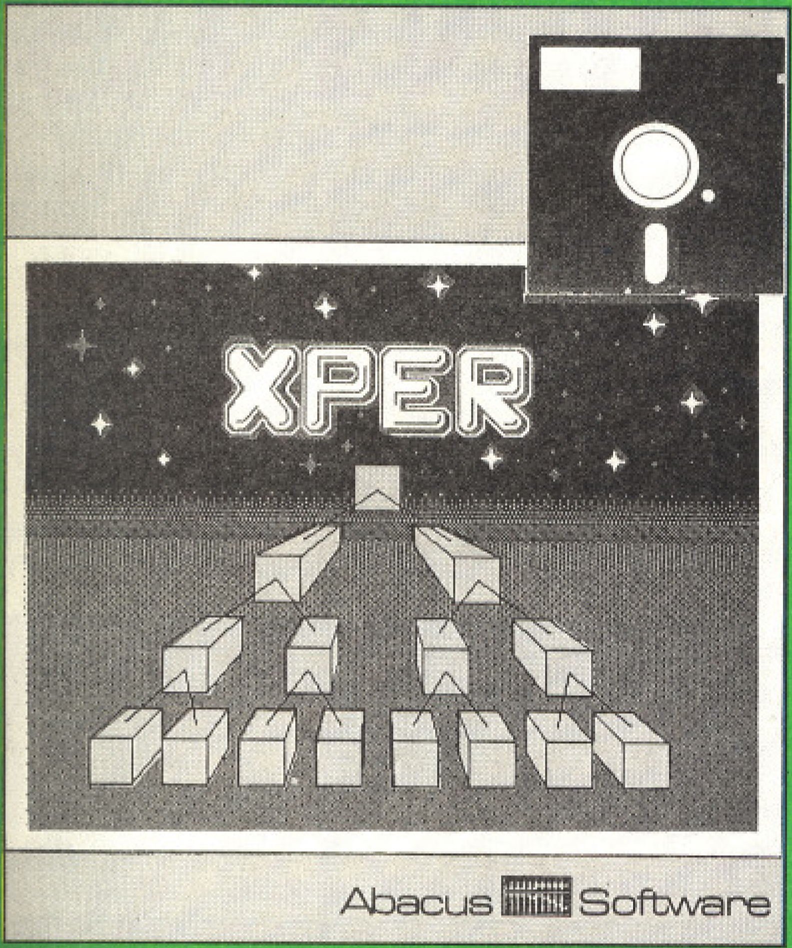
So to XPER. XPER is definitely not expert itself. In fact, it's a device for setting up expert systems, which of course, will only be as good as the knowledge you've filled them with. You can think of it as a sort of structured database system. The designers haven't stinted on features, having included all sorts of ways for you to get at your knowledge.

They've also made the program about as user-friendly as a kill-crazed dingo with halitosis. There is some excuse for this, since this sort of system is usually seen on minicomputers upwards. In a big machine environment, ease of use is positively frowned on.

XPER does have Help menus. The first thing to do on accessing one of these is to reach for the manual to get some help interpreting the help. On doing this, you are faced with gems of English prose such as: 'One or more attributes may define the relation between the feature and the object, which is the intersection of a feature and an object'. Abacus have also invented the novel new verb 'inquirying'.

But...

But, just to be equivocal, in the end I found this to be a good solid piece of software underneath. In some ways it makes a



change from systems that are all friendliness and no substance.

The user should be warned however that there's a lot of undergrowth to hack through first before getting any results.

Which brings us to: what do you use XPER generated systems for ? Apparently the package has already been used to set up knowledge bases in fields as various as tree identification, animal classification and car fault diagnosis, so if you have a special need there may be a system out there for you.

Alternatively, if you possess a priceless fund of hard-gleaned knowledge, the scope is there for you to create a lucrative system of your own — provided your skill is in demand.

And there's one final use — as a first introduction to the Knowledge-Based System. if it were so impenetrable, XPER would be a valuable piece of educational software.

In conclusion, this is an admirable piece of software let down by its own user-hostility. It's worth buying out of sheer curiosity, but if you're strapped for cash, consider carefully whether you need an Expert System, much as you might worry over buying an Accounts package.

Touchline

Title: *Xper.* ***Machine:*** *C64/128.* ***Supplier:*** *Abacus Software.*

WHODUNNITS

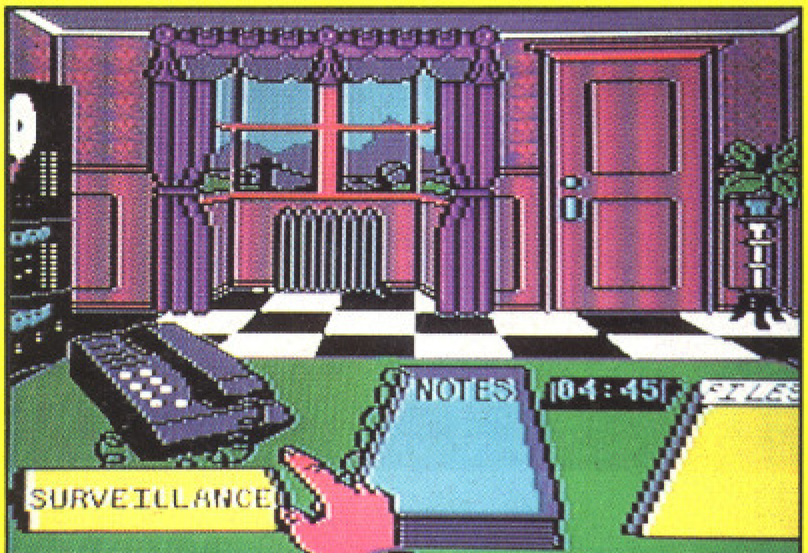
If you're a supersleuth on the trail of murder, mystery and suspense - then look no further than your C64. We've rounded up a collection of cases to challenge the digital detective.

By Tony Hetherington

The software houses have been remarkably slow to get on the trail and for years there were only a handful of adventure-style detective mysteries to solve, such as Sherlock (Melbourne House) which was a spin-off from The Hobbit. Suddenly, that has all changed with a surge of sleuthing software that's as varied as the victims.

Killed Until Dead

Supplier: *Accolade (US Gold)*
Price: *£9.99 (Cassette)*

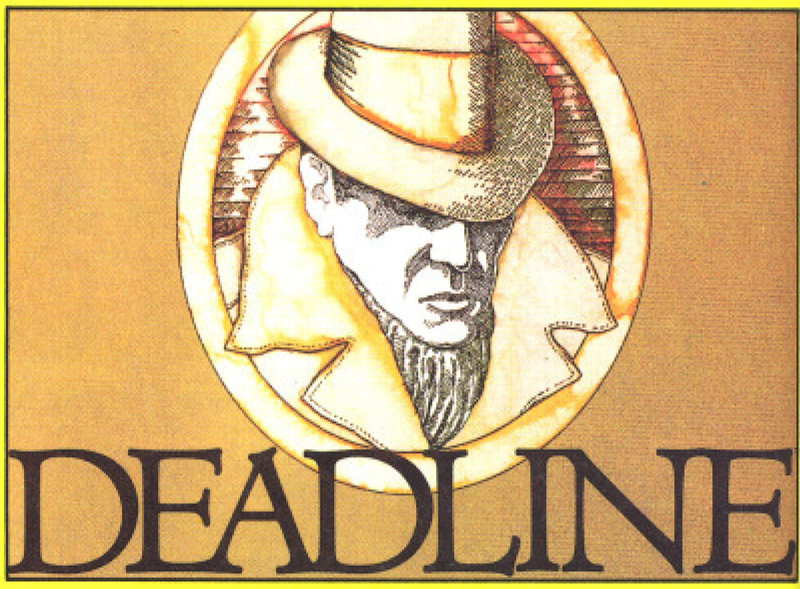


Last month's game of the month poses one of the toughest challenges to would-be hotel detectives - it begins as the Midnight Murder Club book-in. five fanatical crime writers aim to turn their fictitious plots into real murder as they each stake their claim to be the world's greatest murderer!

By using your joystick-controlled files, surveillance cameras, notes and less subtle break-ins you aim to track down the killer before he or she strikes at midnight. Despite the simplicity of the game system each of the twenty one cases is packed with mystery, intrigue, red herrings, twists and surprises that ensure you'll try and complete them all.

Deadline

Supplier: *Infocom (Activision)*
Price: *£24.99 (Disk only)*



Marshall Robner is found dead inside a locked library. Beside him are his tablets - he was taking them for depression. The autopsy shows he died from an overdose The police think it's an open-and-shut case of suicide but Robner's lawyer isn't convinced and has called you in to investigate.

When you open up the case file (game box) you find transcripts of the police interviews with the main suspects, a copy of the post mortem, a photograph of the scene of the crime and even a sample of tablets. This is typical of the quality of Infocom adventures in which you get absorbed in the atmosphere of the game even before you load it in.

Once the disk is loaded you have just twelve hours to solve the crime (if there was one) by sifting through the evidence, searching the massive house, questioning the suspects, deciding the importance of mysterious phone calls to the widow and gambling debts owed by the son and, of course,there's the will that was to be changed the very next day....

Every clue, suspect and situation is described in incredible prose that defies the inclusion of graphics. But be warned - solving the murder before the Deadline is an almost impossible task.

Deadline is one of a hat-trick of Infocom mysteries that also includes Witness, Witness is set in the 1930s - you're a reporter at a society masquerade ball until the hostess is found strangled and you become a Suspect.

Vera Cruz

Suppliers: *Infogrames*
Price: *£8.95 (Cassette) £14.95 (Disk)*



The Vera Cruz affair gives you the chance to sign up for the French police force and investigate the shooting of known prostitute Vera Cruz. She was found in a pool of blood next to a suicide note but you're once again convinced that it's a murder.

The game aims to be an accurate representation of a murder investigation and is played in two parts. In part one you must search the scene of the crime for minute clues by moving a cursor across the scene. If you find anything interesting then you'll get a close-up view and should make a note in your notebook. Armed with these invaluable clues you return to your office to continue your investigation using the *Sûreté's* crime fighting computers.

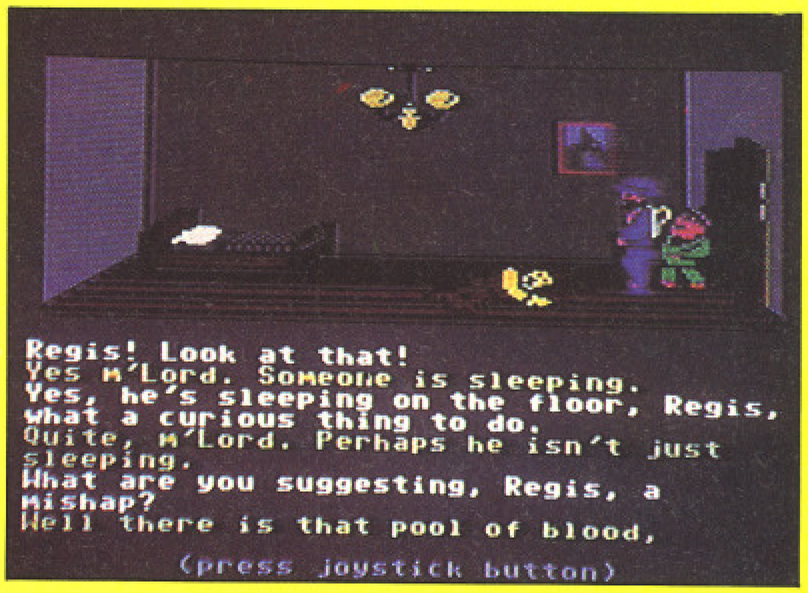
In part two you use computers to send messages to other police forces to check the records for suspects, track down car owners and to find out about past or present prison detainees. You can also order an autopsy and get a statement from anyone as long as you have their name and address. Statements can then be compared with evidence.

Gradually you will begin to widen your knowledge about the life of poor Vera Cruz and her friends and pimps. Next, you'll have to sort out facts from lies and inevitable red herrings until finally, in your best French accent, you can solve the *murdeur*.

The same game system is used in the sequel The Sydney Affair. In this, you must discover why an innocent married man with two children was gunned down with a high-powered rifle and, of course, whodunnit?

Murder on the Atlantic

Supplier: *Infogrames*
Price: *£19.95 (Cassette) £14.95 (Disk)*



Infogrames' third murder mystery shows a complete change in style and gameplay and features a murder on the liner Le Bourgogne during a voyage in the tension-filled pre-war years of the 1930s.

Inside an Infocom-style packed box you'll find the game tape or disk nestled among telegrams, letters in French, German, English and Braille, as well as photographs, secret plans, negatives, passenger lists, a newspaper, a report from the security officer, secret notes, a capsule of ink, business cards, a piece of string and a spent gun cartridge.

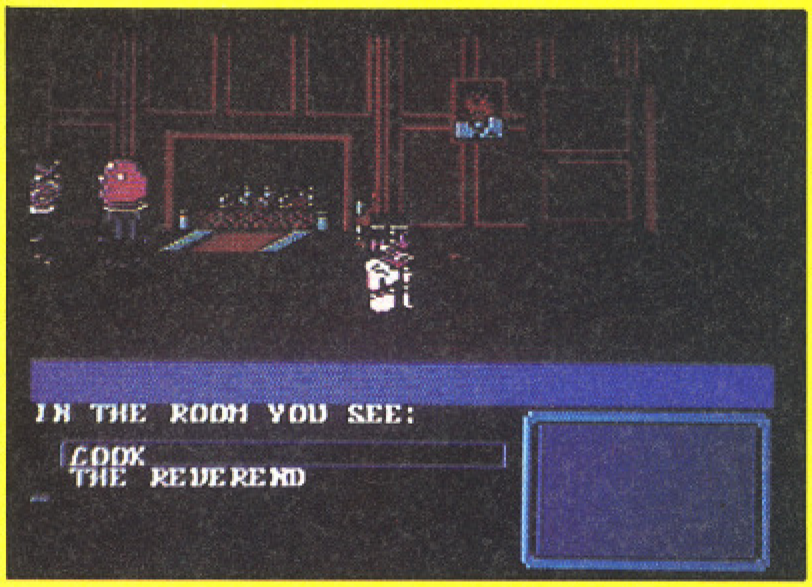
Unfortunately, having all this evidence at your fingertips doesn't make the game any easier and will only confuse you if you try and look at it before you begin the game. Instead you should start with a room by room search of the ship, examine everything, question everybody and collect all the evidence. Then save the game before sifting through what you've got and the copious notes you've undoubtedly made about the forty main suspects. Only then will you understand the next stage and be close to deciphering the web of intrigue on a ship full of spies, secret assignations and masked balls.

Once you think you've solved the crime you can load in a separate test program that will help you check your facts but will probably leave you with more questions than answers.

The Detective

Supplier: *Argus Press Software*
Price: *£8.95 (Cassette)*

The Detective is a joystick-controlled, icon-driven murder inquiry in which you play Inspector Snide (of The Yard) in his investigation of the murder of Angus Macfungus. The mystery begins with an anonymous phone call that says simply: 'MacFungus has kicked it--' this leaves you with a case and no clues. Your only chance is to go to the



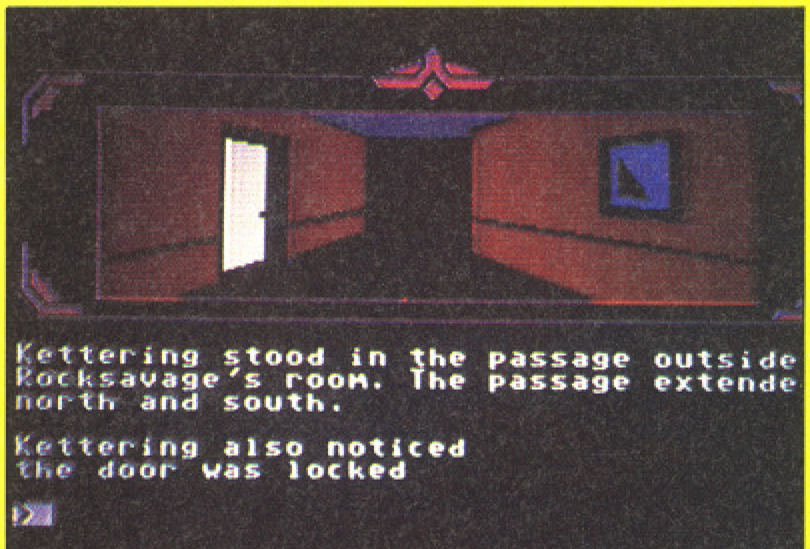
MacFungus mansion and solve the mystery before the killer strikes again.

The mansion isn't an easy place to solve a murder as it's riddled with secret passageways and packed with suspicious characters such as a butler, a mad prfessor, the cook, a maid and an arrogant daughter.

Simple joystick controls move you around the mansion and its many rooms. These are packed with objects to examine and save as well as food to eat, documents to read, and suspects to question. It's all done by pointing to the icons that appear at the bottom of the screen. By cornering the games characters you can question them about the deceased Angus MacFungus, other characters and any objects you've found. Unlike the other games it's as important to explore the mansion, and find the secret passageways, as it is to question the suspects. The result is a playable mixture of murder, sleuthing exploration and more sleuthing when the killer strikes again.

Murder Off Miami

Supplier: *CRL*
Price: *£7.95 (Cassette)*



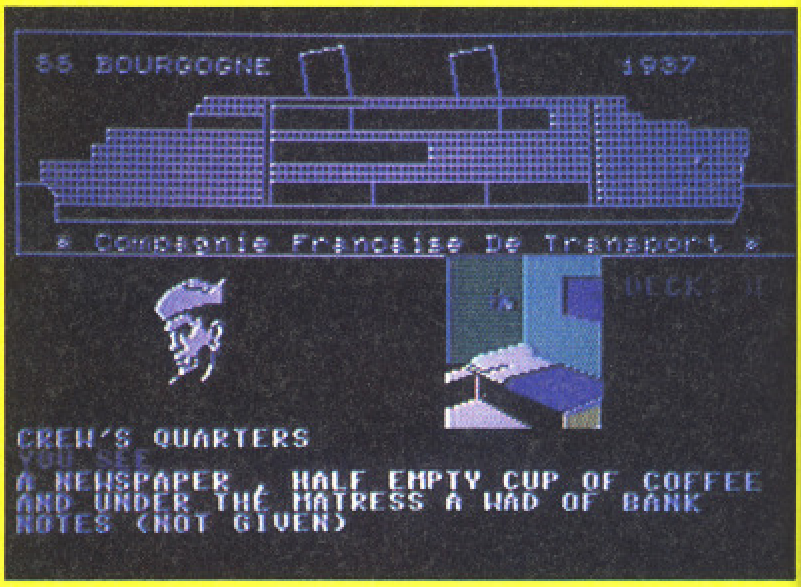
Murder Off Miami is a three-part text and graphic adventure based on a Dennis Wheatley murder mystery. In this digital version you play Inspector Kettering who's been brought in to investigate yet another suspicious suicide. This time the victim is Bolitho Blane who, when alive owned a company that controls half the soap market. Carlton Rocksavage owns the company that controls the other half of the market and it was his boat that Blane was on when he committed 'suicide'.

The game was written using an enhanced version of The Quill and I found it to be rather fussy about the order in which you perform certain tasks. For example, Kettering can't pick up his magnifying glass before he receives the memo about Blane.

The game consists of three parts that represent the three days of the investigation. They must be completed in order - you save the game position after each part so that you can load in the next.

Murder on the Mississippi

Supplier: *Activision*
Price: *£14.99 (Disk)*



Sir Charles Foxworth and his trusty manservant Regis are enjoying a trip down the Mississippi when they stumble across a body and a murder to solve. With the blood still warm, our aristocratic sleuth sets out to search the cabins for clues and question the passengers about objects he has found, the victim, other characters, and themselves.

Through joystick control our heroes explore the riverboat and its cabins and question anybody they meet through joystick menus. From their testimony you can pick out crucial points for your notes. These notes form the foundation of your investigation and can be shown to other characters, such as the judge, to get their reactions and perhaps more clues.

Unfortunately, Sir Charles and his sidekick represent a stereotyped American view of the British and so the game is littered with 'I say, M'Lord's' which can be irritating but if you manage to ignore them you'll enjoy the game.

Making Music

The Commodore 64's sound chip, SID, is among the best of its kind. Yet it's proverbially hard for the beginner to get to grips with. In the first installment of a new series Peter Gerrard shows you how.

By Peter Gerrard

Whether your Commodore 64 is new or old, you must all have read phrases like 'Your Commodore 64 computer is equipped with one of the most sophisticated electronic music synthesisers available on any computer'. You then look at a simple listing to produce just one note, and soon realise that sophistication is not equivalent to ease of use. A myriad of POKE instructions, no special BASIC keywords to make the task easier, and an awful lot of work required to make even the simplest of noises.

Those are its bad points. But what of its good ones? What, probably, does the Commodore 64 give us for our money?

The SID Chip

The quaintly named SID (boringly standing for Sound Interface Device) is indeed a very powerful custom-built chip. Most other computers with sound capabilities have something like an AY Sound Generator built into them and this, although in itself useful, cannot hope to compete with the excellence of something that was designed for a specific computer. AY chips are mass produced, and can be used by many different machines, but SID is a one-off and was built just for the Commodore 64. If you see SID, tell him!

Voices

SID has the capability to control three separate musical 'voices'. That is, three distinct effects can be created and used to produce anything from a musical concerto to discordant noise. One voice could be producing a sound rather like an accordion, another could be imitating a banjo, while the third could be producing some kind of percussive effect. However, SID is not without its faults in this respect, since we have to play all three of these voices at precisely the same volume. We can control that volume without reaching for the volume control of the television or monitor (since the Commodore 64 is one of those rare home computers that produces its noise through an external rather than an internal device), but that volume must be the same for all three voices. Other factors, as we shall be seeing, must also remain constant across the three voices.

Envelopes

Envelopes, as well as being something that you can post a letter in, also find a very useful home in the world of music, and the world of computer music in particular. The type of sound produced by any of the Commodore 64's voices is determined to a large extent by the musical envelope being used to create that sound. It affects the voice quality, and can be independently altered for any of the three voices.

The four factors controlling a musical envelope are referred to as Attack, Decay, Sustain and Release, or ADSR from now on. Attack tells us how long it takes a note to rise from zero volume to maximum volume. Decay refers to the length of time taken to fall from that peak volume to merely a half of that volume. Sustain then determines the length of time that the note is then played at half volume, before Release tells us how long it takes the note to fall back into silence once more. ADSR collectively make up the envelope of a note, and as we've seen can be independently altered for any of the three voices.

Waveforms

The waveform of a note is another factor in determining precisely what type of note is going to be played. On the Commodore 64 we have control over four distinct waveforms, and these are known as Triangle, Sawtooth, Pulse and White Noise. Typically, a triangular waveform can be used to produce a mellow sound, rather like a flute, while a sawtooth waveform, rich in harmonics, has a more strident tone, like a trumpet perhaps. Pulse waveforms are possibly the most interesting, since they can be used to produce anything from a dull, hollow tone to an almost nasal whine.

Finally, white noise waveforms are precisely what they say they are, and are usually used to produce sound effects ranging from something as straightforward as a wave lapping on a shore, or a snake hissing at its prey, to something more complicated, like the percussion section of a rock group. The group Velvet Underground were once described as playing music that sounded just like 'white noise'. How they would have liked the Commodore 64!

Filters

Each of our three voices can have a totally different envelope, and can also be playing any one of the four

waveforms independently of the other voices. Similarly, each voice can either be filtered or not, but the effects of filtering are then the same for any voice that is being treated in this way. Filtering refers to the reduction of frequencies around a particular frequency, perhaps losing those above a certain level, or below a certain level, or perhaps passing those frequencies either within or outside of a band of frequencies. Four different types are available to us on the Commodore 64.

Advanced Features

Two very advanced features are also available to us on the Commodore 64, and are not often encountered on relatively inexpensive home computers. The first of these is known as Ring Modulation, and despite its rather unusual title refers to nothing more complicated than modulating one voice with respect to another. In other words, if voice one were modulated with voice two, then anything that one voice would do would also be echoed, in some way, in the other voice. This is one of those things that is easier to demonstrate than it is to explain!

Synchronisation is another step in the direction of a true synthesiser rather than an ordinary noise-making machine. As with ring modulation it is probably easier to grasp the concept by listening to something rather than reading about it, but basically it involves linking one voice with another so that, rather than modulating, or varying the frequency and volume of one voice with respect to another, we try and produce the same sound with two (or even three) voices. Thus one could produce a simple twelve bar riff with one voice and synchronise it with another voice, so that by merely altering one note in the second voice the twelve bar riff is instantly playing in a different key. We'll be taking a close look at this sort of technique later.

Conclusion

Well, the Commodore 64 *is* equipped with one of the most sophisticated electronic music synthesisers available on any computer. It's just one of the most complicated to use, that's all.

Throughout the rest of this supplement, however, we will be making life an awful lot easier, and by traversing the gulf from a single note to a ten minute interrupt-driven soundtrack and (almost) a true synthesiser we should manage to cover just about everything that the Commodore 64 is capable of doing by way of producing music.

The key to all of this is, of course, the SID chip and its contents, so we'll now take a look at those.

SID Chip and Contents

The SID Chip, as we have already seen, is a purpose-built one, designed specifically for the Commodore 64. As such it takes up a reasonable amount of memory within the 64 without affecting anything that might really be of concern to you, the programmer. Its code is quite happily resident in ROM, it takes up none of the available RAM space, and the spare 4K of RAM from $C000 to $CFFF is more than enough to cope with the more sophisticated sound effects that we will be coming to later.

However, as far as programming the chip goes we have a mere 29 bytes to play with. Of those, only 25 are of any real concern to us, sicne four of them are what is termed **Read-Only**, and cannot be altered by simple PEEKing and POKEing. In fact, they cannot be altered at all, and although they are not without their uses for any of you who might happen to possess a potentiometmer or an oscilloscope perhaps, we will ignore them for the rest of this supplement. As far as affecting 99% of all sound programs go, they are the Commodore 64's equivalent of certain England footballers: there to make up the numbers.

The other 25 bytes are, on the other hand, of great interest to us, and we will be dealing shortly with each of them in turn, since without a thorough knowledge of where they are and how they work we cannot begin to produce anything even vaguely useful. These 25 fall into the category of **Write-Only**, which means that we can alter them but not manage to see what is in the first place. This, as you might think, is something of a problem at times.

At the risk of offending readers who know all about selectively altering the contents of memory locations (since that is all we can do with these 25 bytes, or Control Registers to give them their grander title), a few words of explanation.

PEEKing and POKEing

Everyone is familiar with statements like POKE 832,32 or PRINT PEEK (832). That is, put the value 32 into memory location 832, or print out the content of memory location 832 respectively. However, as far as the 25 control registers of SID are concerned, PRINT PEEK (register) produces nothing sensible. Try PRINT PEEK (54296), which is one of the registers in question, and see what happens. You will be told that register 54296 contains a zero. So, alter it with POKE 54296,25 and then try PEEKing it again. To all intents and purposes it still contains a zero, or a least that is what the Commodore 64 wants you to think. It does, in reality, contain the value of 25, but we cannot find that out directly. Other methods have to be used, and by far the simplest of these is to keep track of a variable, FI say, so that we could POKE 54296,FI and PRINT FI to find out what is going on.

Unfortunately for us, some of these 25 control registers perform more than one task. Six of them do, in fact, and they are all of vital importance to us in our quest to produce something that would make Jean Michael Jarre sit up and take notice, or Ron Hubbard for that matter. As far as those six registers are concerned then, a simple POKE command will not normally suffice. We must selectively alter the content of a register, not just alter it willy-nilly. Consider the following example.

```
POKE 54296,15
POKE 54296,16
```

Although the value put into register 54296 is different by just one in the two POKE statements, the effects that would be produced are vastly different, to say nothing of catastrophic under certain circumstances. What do we really mean, then, when we POKE 54296,15?

The Commodore 64 is an 8-bit computer, which means that any byte, memory location, control register, call it what you will, consists of 8 bits. As you probably also know, the maximum value that can be POKEd into any one location is 255, and this is as a direct result of it being an 8 bit computer. Bit is short for BInary digiT, and is the smallest value that the computer can understand. They (computers that is) work at their most efficient when everything is converted into binary digits. After all, a

computer is nothing but a collection of electronic circuits, and a circuit can be either on or off, nothing else, and so the binary system of counting is ideal for representing these two states. Binary uses only the numbers zero and one, so a zero would represent a circuit that was switched off, and a one, a circuit switched on. Since there are eight bits to the byte (and yes, four bits really are referred to as a nybble), we can think of a byte as looking like this:

128 064 032 016 008 004 002 001
7 6 5 4 3 2 1 0

So,we have eight bits (numbered from Zero to seven) and each of those eight bits can be either on or off. The numbers above those bits refer to the value that each represents. Thus, if bit 7 were turned on and all the rest were turned off, then the byte would contain the value of 128. If bit 6 were turned on and the rest turned off, it would contain the value of 64, and so on. Now then, if bits 3, 2, 1 and 0 were turned on, and the rest turned off, what value would be in there?

Add up the numbers 008, 004, 002 and 001 and we arrive at 15, as in POKE 54296,15 given earlier. If bit 4 were turned on, and the rest turned off, the byte would contain the value of 16. Again, as in POKE 54296,16. Do you see what has happened? By POKEing with 16 instead of 15 we have turned on a bit that was previously turned off, and turned off four bits that were previously turned on. If this were a register with just one purpose it wouldn't make any difference, but 54296 happens to be one of those with a dual purpose in life, as we shall be seeing shortly.

Turning On

Consequently it is important, when altering this and other dual-purpose registers, to make sure that what was turned on remains turned on (if necessary), and what gets turned off is indeed what we want to turn off. This is achieved using the commands AND and OR, which, as you may know, work like this:

10101010
11001100

ANDing those two numbers together produces the result 10001000. In other words, wherever there is a 1 in the top row that corresponds with a 1 in the bottom row, we put down another 1. Anything else results in a zero. Thus bits 7 and 3 remain turned on, the others are turned off.

On the other hand, ORing those two numbers together produces an entirely different result, namely 11101110. In this case, wherever there is a 1 in the top row OR a 1 in the bottom row we put down a one. So, in this instance, bits 7, 5, 3 and 1 remain turned on, and we also turn on bits 6 and 2 (this is beginning to sound a bit psychedelic!). The rest remain off.

By selectively altering various bits of a byte, then, we can happily work with dual-purpose registers and alter only that which we want to alter. A lengthy, but necessary, diversion, if we are to get the best out of the 25 available-to-alter control registers of the SID chip. And now, before we go any further, what do those registers do? The following diagram shows us that, and this is to be our Bible from now on. We can do nothing but alter the contents of these 25 registers, and without knowing where they are in memory we're not going to get very far. Don't worry yet if some of the terms used don't make a lot of sense, all will be revealed in the long run.

First Steps

As can be seen from the diagram of the SID Control Registers, there are an awful lot of memory locations to worry about in the world of sound. However, to make life easier for us in these early stages we are only going to bother with eight of those 25 registers, and these eight are made up of seven for voice one, and the overall volume control for all three voices.

In order to produce a single note, which is all we'll be bothering with here, there are a number of steps to take. First of all, it's always best to clear out any extraneous values that may be stored in any of the 25 registers, and this can be achieved by using a simple FOR ... NEXT loop, like this perhaps:

```
5 FOR I=0 TO 24:POKE 54272+I,0:
NEXTI
```

Then, it is always wise to declare a variable equal to our base location, since remembering things like 'variable plus 7' is a lot easier than trying to recall all the different numbers like (54279). Usually I use the variable V, and so the second line of our program would be something like:

```
10 V=54272
```

Having done that, four simple steps are necessary in order to be able to produce a note. We'll now consider each of those steps in turn.

Volume

If you look at the table of SID control registers, you'll see that the volume is governed by location (V+24). It is also one of those registers that is allotted more than one function in life, but for now we are concerned only with turning the volume on. From the table, and our earlier discussion of bits within bytes, you will probably realise that the volume can range from zero through to 15, since the first four bits of the register are used to control the volume, and turning all four of those on gives us a value of (8+4+2+1), or 15.

A little bit of common sense serves to tell us that the maximum volume would relate to the maximum value, and so if we alter location (V+24) by POKEing it with a 15, we will achieve that maximum volume. It helps if you've got the television set tuned properly and the volume turned on as well.

Consequently, the next line in our program would be something along the lines of:

```
15 POKE V+24,15
```

We must now turn our attention to the envelope, or ADSR shape, of the note that we're going to play.

ADSR

Later on we'll be looking at this in much more detail, and with the aid of a program showing precisely how the different ADSR settings, or Envelope shapes, determine to a large extent the quality of the note being played.

For now, we will concern ourselves with two facts. The locations affecting ADSR for voice one are (V+5) and (V+6), and each of those locations is split into two halves, or nybbles. The top half affects attack and sustain respectively, while the bottom half concerns itself with decay and release, in the order. So, when we alter the content of location (V+5) we are affecting both the attack *and* the decay rate. Harking back to our discussion of

SID CONTROL REGISTERS

Base Location = 54272

Location	Bit Diagram	Base	Function
54272	1 1 1 1 1 1 1 1	0	Low frequency value
54273	1 1 1 1 1 1 1 1	+1	High frequency value
54274	1 1 1 1 1 1 1 1	+2	Low pulse width
54275	1 1 1 1 1 1 1 1	+3	High pulse width
54276	1 1 1 1 0 2 3 1	+4	Wavelength/Ring Mod/Synch
54277	2 2 2 2 1 1 1 1	+5	Attack/Decay
54278	2 2 2 2 1 1 1 1	+6	Sustain/Release
54279	1 1 1 1 1 1 1 1	+7	Low frequency value
54280	1 1 1 1 1 1 1 1	+8	High frequency value
54281	1 1 1 1 1 1 1 1	+9	Low pulse width
54282	1 1 1 1 1 1 1 1	+10	High pulse width
54283	1 1 1 1 0 2 3 1	+11	Wavelength/Ring Mod/Synch
54284	2 2 2 2 1 1 1 1	+12	Attack Decay
54285	2 2 2 2 1 1 1 1	+13	Sustain/Release
54286	1 1 1 1 1 1 1 1	+14	Low frequency value
54287	1 1 1 1 1 1 1 1	+15	High frequency value
54288	1 1 1 1 1 1 1 1	+16	Low pulse width
54289	1 1 1 1 1 1 1 1	+17	High pulse width
54290	1 1 1 1 0 2 3 1	+18	Wavelength/Ring Mod/Synch
54291	2 2 2 2 1 1 1 1	+19	Attack Decay
54292	2 2 2 2 1 1 1 1	+20	Sustain/Release
54293	0 0 0 0 0 1 1 1	+21	Low frequency
54294	1 1 1 1 1 1 1 1	+22	High frequency
54295	1 1 1 1 2 2 2 2	+23	Resonance/Filter
54296	0 2 2 2 1 1 1 1	+24	Filter type/Volume

'O' - bits we are not concerned with, or cannot use.
'1' - bits affected by first mentioned function.
'2' - bits affected by second mentioned function.
'3' - bits affected by third mentioned function.

Locations 54272-54278 affect voice one.
Locations 54279-54285 affect voice two.
Locations 54286-54292 affect voice three.
Locations 54293-54296 *can* affect all three voices.

bits and bytes again, we will see that four bits can give a value in the range 0 to 15, so it makes sense to think of both attack and decay as varying within that range.

However, how can we POKE two numbers with values between 0 and 15 into the same register? Well, think about it, and you'll see that the decay rate is indeed a value from 0 to 15 (it affects the lower four bits of the byte), while the attack rate is determined by the top four bits. Assuming then that we have an attack rate of somewhere between 0 and 15, then by multiplying that value by 16 we can arrive at the overall value to be stored in location (V+5). So, for an attack rate of 2 and a decay rate of 9, we would arrive at a final value of (2*16 + 9), or 41.

Since the same principle applies to sustain and release as well, with sustain being multiplied by 16 and release just having a straightforward value, the next line of our program (assuming a sustain value of 1 and a release value of 5) would look like this:

20 POKE V+5,41:POKE V+6,21

The third step is to consider the wavelength of the note that we're going to play.

Wavelength

We have already seen that there are four different types of wavelength available to us on the Commodore 64: triangle; sawtooth; pulse and white noise. From the table of control registers you'll see that the wavelength is governed by location (V+4), and that this is yet another of those multi-purpose registers. Ignore those bits that affect ring modulation and synchronisation for now, and we arrive at the following mini-table of values:

Wavelength	Value
Triangle	17
Sawtooth	33
Pulse	65
Noise	129

That is, by putting a value of 17 into location (V+4) we would set the wavelength of voice one to be that of a triangle. Putting a value of 16 in it would turn that voice off, although zero works just as effectively. In a similar way, we would put a 33 into location (V+4) and get a sawtooth waveform, or put a 32 there and turn it off again. Noise is just that, noisy, and although you're welcome to experiment we'll stick to something a little bit more musical for now.

The Pulse waveform is the most interesting, and requires two more locations to be brought into play, namely (V+2) and (V+3). These determine the width of the pulse, that is, the length of time it takes between two successive peaks of the waveform itself. (V+2) is the low value of the pulse width, and (V+3) is the high value, or to put it another way, if we had a value of 4 in location (V+3) and 25 in location (V+2) then the overall pulse width would be (4*256 + 25), or 1049. Multiply the high value by 256 and then add the low values. See if you can figure out why that should be so, remembering that only numbers between 0 and 255 can be stored in a single byte.

Experiment with pulse waveforms by all means, altering the high and low values *after* you've set the waveform itself. For now we'll stick to a sawtooth waveform, and bearing in mind an important fact when producing music on the Commodore 64 (it is ALWAYS advisable to clear the waveform and then re-set it before playing a note) we arrive at the next line in our program:

25 POKE V+4,0:POKE V+4,33

Finally, we need to play the note itself.

Cont. next month

Games Reviews

If you've got a bit of spare cash then a game is as good a way as any to use it up. Here's a selection of some of the latest software on offer.

ENDURO RACER

At the end of the Coin-op Conversions feature (Your Commodore July 87) I predicted that there were more conversions on their way. As if to prove my point Activision releases it's version of the Sega coin-op bike racing game.

The object of the game isn't to win a race but to complete five stages within set time limits. If you don't beat the clock your game will end.



The first stage is a simple track that's flanked by trees to write off anyone trying to cut corners. Bike-mangling barriers are strewn across the whole track and can be only jumped by a well-timed wheelie.

In the next state giant boulders block your path, both on and off the track, and in stage three the track is surrounded by water so any mistake will end in a costly loss of time.

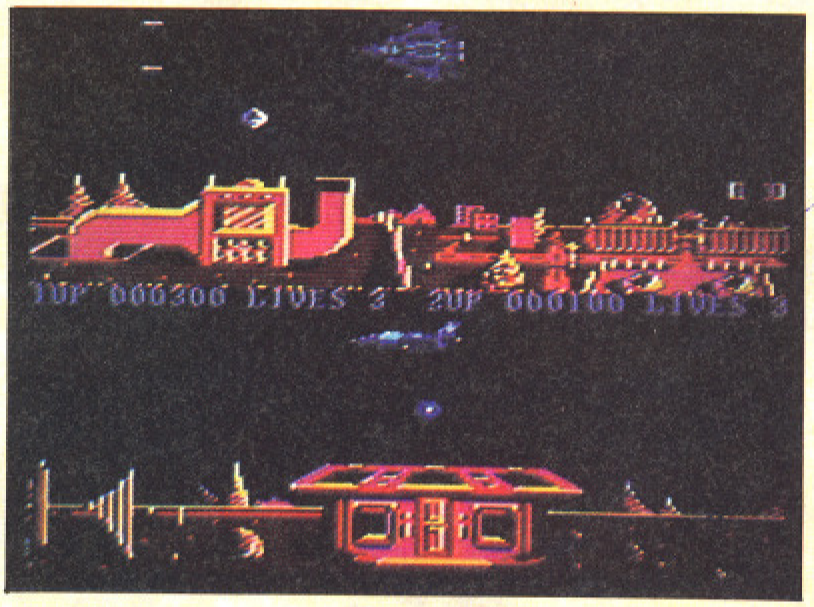
There are other bikes in the race but these seem to take no part in the game as you can happily ride through them without crashing or even slowing down.

Sadly this is another case where the C64 game is a direct copy of the original Spectrum game and wastes the C64's superior sound and graphics capabilities. A waste of a game that could have been a coin-op classic. T.H.

Touchline

Title: *Enduro Racer.* ***Supplier:*** *Activision, 23 Pond Street, Hampstead, London NW3 2PN.* ***Tel:*** *431 1101.* ***Machine:*** *C64.* ***Price:*** *£9.99.* ***Originality:*** *3/10.* ***Playability:*** *6/10.* ***Graphics:*** *5/10.* ***Value:*** *5/10.*

EAGLES



The year is 2846 and the galactic three hundred year old war is now fought by genetically-created beings like yourself. Now you are once again ordered to scramble into the sky in your Eagle aircraft to defend the planet against alien attack.

The screen is split into two Defender-style game screens in which you and your partner must blast away at the terminators, killer squads, nasty patrols, warriors, bouncers, tracers and fireballs that have invaded every zone. As your skill improves you'll be able to collect the enemy message droids that you must deliver to your underground base. Collect five of these and your ship will be equipped with a Devastator device which acts like a smart bomb destroying all aliens on the screen.

The second ship can either be controlled by a human or computer opponent, that you compete with to get the most kills to win the honour to lead the squadron. If you're playing against the computer or a head to head opponent you must duel to death to prove your superiority. This seems unlikely - it's a little pointless to have Eagles fighting each other when there are hordes of aliens to be destroyed.

A poor game that falls short of Hewson's usual standard. T.H.

Touchline

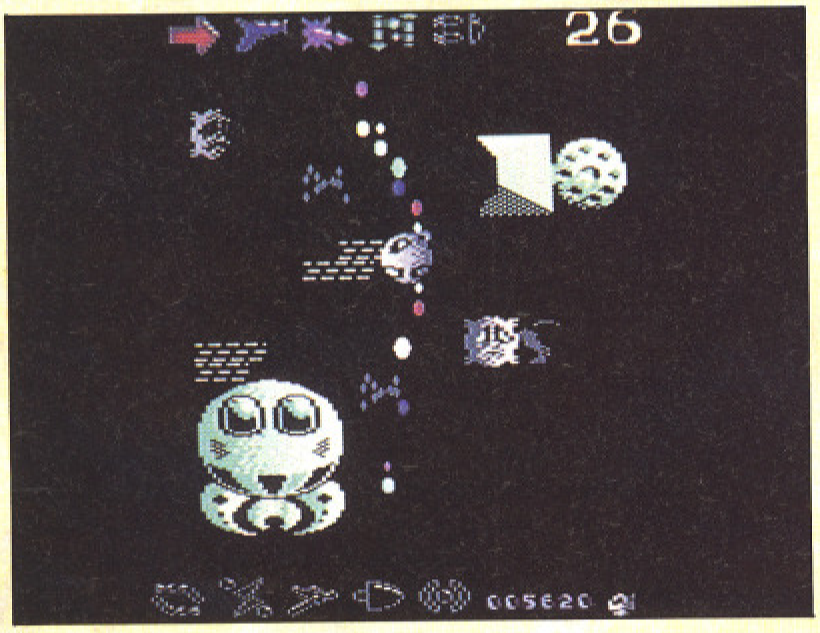
Title: *Eagles.* ***Supplier:*** *Hewson Consultants, 56B Milton Trading Estate, Milton, Abingdon, Oxon14 4SX.* ***Tel:*** *0235 832939.* ***Machine:*** *C64.* ***Price:*** *£8.95 (Cassette) £12.95 (Disk).* ***Originality:*** *5/10.* ***Playability:*** *6/10.* ***Graphics:*** *8/10.* ***Value:*** *6/10.*

I BALL

Where's that smoke coming from? Oh no, it's my power supply burning up. You see I loaded up I Ball about five hours ago and I can't stop playing it.

When I loaded I almost fainted – the speech is fantastic. A funny little voice says 'I Ball, I I I Ball'. This sounds wonderful. When you are killed the voice says 'Oh no!' and at the end of the game the voice says 'Game Over'. The music is also brill and very well thought out, which gives the game a very polished feel.

You control a renegade ball, on a mission to rescue his pals from the totally evil terry ball. Your pals, lover ball, eddy ball, glow ball and no ball are all scattered across 16 different defence zones and one pal can be found at the end of every fourth screen.



Reaching them is no easy task; there are solid obsticals and electric barriers that will sizzle you on contact, together with the millions of nasties that inhabit the defence zones. If you shoot a lot of these a power disk will appear (hints of Nemesis here) and when collected will give you extra weapons such as a Single Laser, which lets you fire sideways, a Turbo, which gives you extra speed, and a Bullet spray, which gives powerful fire support above and below you. Also available is the Molecule Bomb which nullifys all the electrical barriers (very useful). Another wicked weapon is the Rainbow Ripple Laser (sounds a bit like Salamander) which will blow the most confident Pod Person from Mars into a thousand blistering blisters.

Sound-wise this game is great, with good speech, good music and good spot effects. It is also strong on graphics with clear characters, no flicker, smooth scrolling and smart effects produced by the weapons.

I could go on for ages about the great gameplay, fantastic value and sheer addictiveness of the game, but I won't.

Go and buy I Ball. If you don't you must be mad. **K.R.**

Touchline
Title: *I Ball.* ***Supplier:*** *Firebird 64/67 New Oxford Street, London WC1A 1PS.* ***Tel:*** *379-6755.* ***Machine:*** *C64.* ***Price:*** *£1.99.* ***Originality:*** *8/10.* ***Playability:*** *9/10.* ***Graphics:*** *8/10.* ***Value:*** *10/10.*

CHAMPIONSHIP BASEBALL

Championship Baseball is a rewrite of Gamestar's previous attempt to capture the thrill of home runs, base hits and loaded bases and adds split-screen pitching as well as four divisions of opponents, and play-offs for the



championship pennant.

Your first task as coach is to select your batting line-up to face the first match. Make sure you've got some utility players sitting on the bench in case your star batsman holes out or your pitcher starts giving away home runs.

As the game begins the screen shows a sideways-on view of the ball park with fielders spread around the bases and the outfield. When a ball is about to be pitched half the field is covered by a 3D batsman's view of the pitcher as he winds up to deliver change-ups and fast balls. Once the ball is hit the screen reverts back to the whole fielding screen.

The result looks and plays like a patch stuck on to the original (poor) game. You're left wondering why the game wasn't totally rewritten to produce full 3D action. That might have come near to its claim to be the 'most realistic baseball simulation you can find'. I'm sticking to hardball. **T.H.**

Touchline
Title: *Championship Baseball.* ***Supplier:*** *Activision (Gamestar). 23 Pond Street, Hampstead, London NW3 2PN.* ***Machine:*** *C64.* ***Price:*** *£9.99.* ***Telephone:***, *431 1101* ***Originality:*** *3/10.* ***Playability:*** *6/10.* ***Graphics:*** *6/10.* ***Value:*** *6/10.*

OINK!

Ever wondered how a magazine is put together? Well, here's your chance to see how the Editor and staff of Oink! fill the pages with jokes, features and competitions.

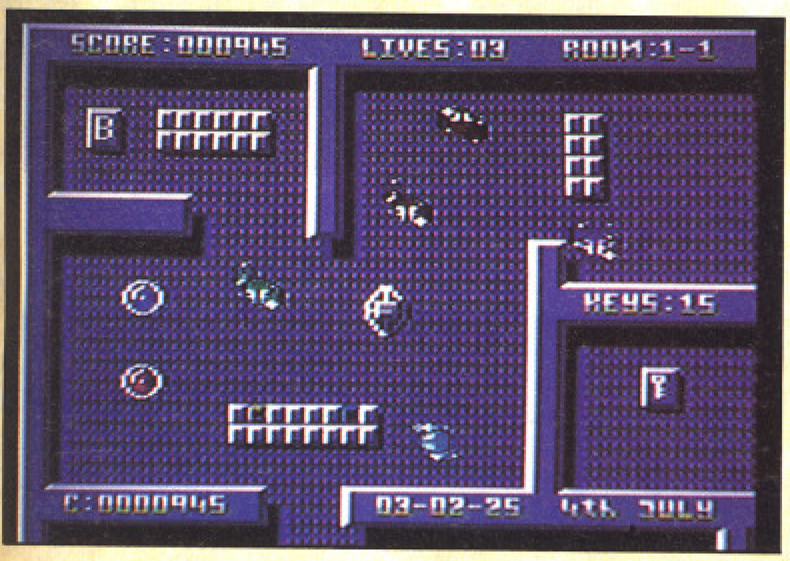
The game casts you as Uncle Pigg, the Porky proprietor of Oink! and you must play three sub-games to win bonus panels that are used to fill the comic. You can compete in the

sub-games as often as you like but after each game you're three hours closer to the deadline.

Game One is basically Breakout - your missile firing bat must bounce Pete's Pimple back to destroy a series of brick walls while fighting off hordes of deadly aliens. In Game Two you steer Rubbishman through a series of zones in which you must fly over objects and under bridges while conserving power. Game Three stars Tom Thug as he charges around a complex in his Thugmobile, fights zombies and halts trackers while he attempts to collect (shoot) bonus panels, extra lives, and a score which represents the magazine's growing circulation.

As the pages build up you'll be able to read the adventures of these heroes as well as check your horoscope, read jokes and enter competitions - but I doubt you'll have the time.

Across the far side of the galaxy, the deadly Moose-faced Warlocks of Thrunge are about to invade the peace-loving Fried-Egg People of Nostrilia, but forget them as you'll be too busy playing this addictive game. **T.H.**



Touchline

Title: *Oink.* ***Supplier:*** *CRL Group PLC, CRL House, 9 Kings Year, Carpenters Road, London E15 2HD.* ***Tel:*** *533 2918.* ***Machine:*** *C64.* ***Price:*** *£8.95 (Cassette) £14.95 (Disk).* ***Originality:*** *6/10.* ***Playability:*** *8/10.* ***Graphics:*** *6/10.* ***Value:*** *8/10.*

GERRY THE GERM

I've heard of some duff titles but this takes biscuit. You play the part of a germ who has failed his stinkploma exam and, filled with indignation, he sets out to claim the title of 'Virulent Virus Of The Year', so off he goes to infect a body with his disease. To start off with he has to deprive the lungs of air thus starving the brain, but while doing this he comes under attack from the red blood cells and white cells. So he then moves on to the kidneys. Here he must again dodge the white and red blook cells, and while he is doing all this he must collect four wacky kidney beans (wait for it) so he can go to the loo.

Next it's onto the stomach where he must grab a bottle of acid and dissolve the aspirin which blocks the exit to the next screen. Junk food is another problem, you must stop this entering the stomach just by touching it, and when all that's been done (phew!) it's on to the pancreas. This is a tricky little screen and a bit stupid too. You must infect the medical supplies by nutting (i.e. headbutting) them - daft isn't it? Again there are blood cells to be avoided, plus a ticket inspector complete with steam engine. If you go to the engine you can cause a fight between the engineer and the driver by throwing coal at the latter...excuse me...just what planet does this so-called human come from?

And now the one you've all been waiting for The Heart. The idea here is to cause a heart attack by deflecting an arrow into this poor organ. To deflect the arrow just use the television (sic) but the arrow will kill you if you do not have the TV. With all this done you are now eligible for a 'stinkploma degree'.

Well, I must admit this game is different but that doesn't always make for brilliance does it? I feel the plot is in bad taste and some of you may well agree. Gameplay is rather dull and slow and it can often get quite tedious. The music, supplied by Rob Hubbard, is brilliant, really jolly and bouncy. About seven tunes in one game can't be bad.

So should you go out and buy this game? On the grounds of cool music maybe, but the game leaves a lot to be desired. If you are bored and have two quid to spend it might prove entertaining – for a while. **K.R.**



Touchline

Title: *Gerry the Germ.* ***Supplier:*** *Firebird, Wellington House, Upper St. Martins Lane, London WC2H 9DL.* ***Machine:*** *C64.* ***Price:*** *£1.99.* ***Originality:*** *7/10.* ***Playability:*** *5/10.* ***Graphics:*** *4/10.* ***Value:*** *8/10.*

MILK RACE

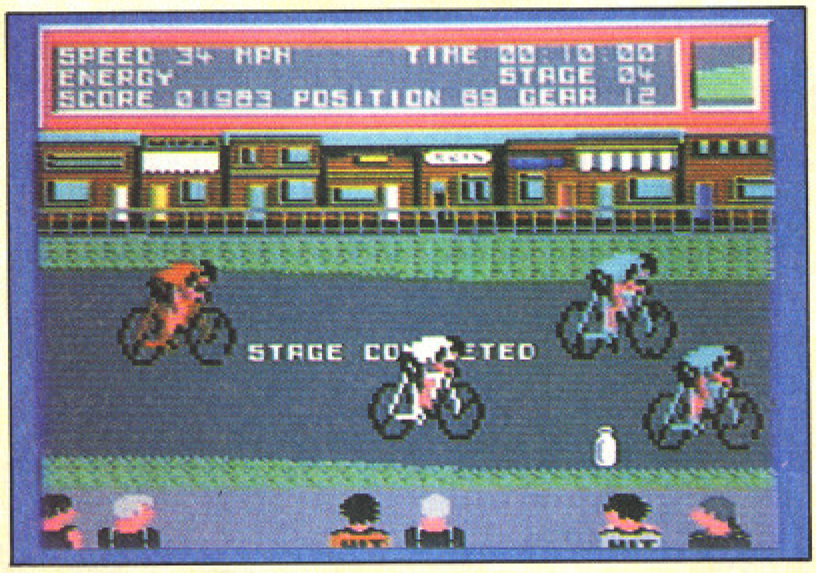
Put on your shorts, fill your water bottle (sorry, milk bottle) and jump on your 13-gear racer, yes it's here – Mastertronics' Milk Race. Was it worth the wait?

Well I'm saying nothing yet. The idea is simple - just race through all the major cities of England – sounds simple doesn't it? As just one of the 84 Competitors in this year's Milk Race you'll need to summon up all your energy and stamina to maintain 1st position over all 13 stages of the race which you must do in order to win.

The game starts up with the title screen of a man pedaling

his bike up a hill accompanied by a soundtrack which also plays through the game. With a tap on the joystick button you are then presented with a map of England showing the route marked out and numbered. Tap the joystick again and a menu is thrown up on the screen which will let you choose a joystick in port two, redefine the keyboard or choose preset keys.

When this has ben selected, it's onto the game, you start off in first gear and can change, if you wish up to 13th gear, depending on road conditions. The road is shown on a little graphic icon in the corner of the screen which rises and falls – when on level ground it falls straight. I thought this a good touch.



The game, however, can be quite frustrating - you will probably find yourself screaming at your computer as you are killed off without any warning by a hit-and-run car driver. This causes a time penalty which could result in the game ending, but practice makes perfect.

I quite enjoyed this game, the graphics are good, the sound is good and there are some very nice touches. For example when you ride past a spectator he will turn his head as you pass him - this gives a good feel and adds to the atmosphere.

For only £1.99 who can moan (Mary Whitehouse?) Go and get it before the shops sell out, quick. **K.R.**

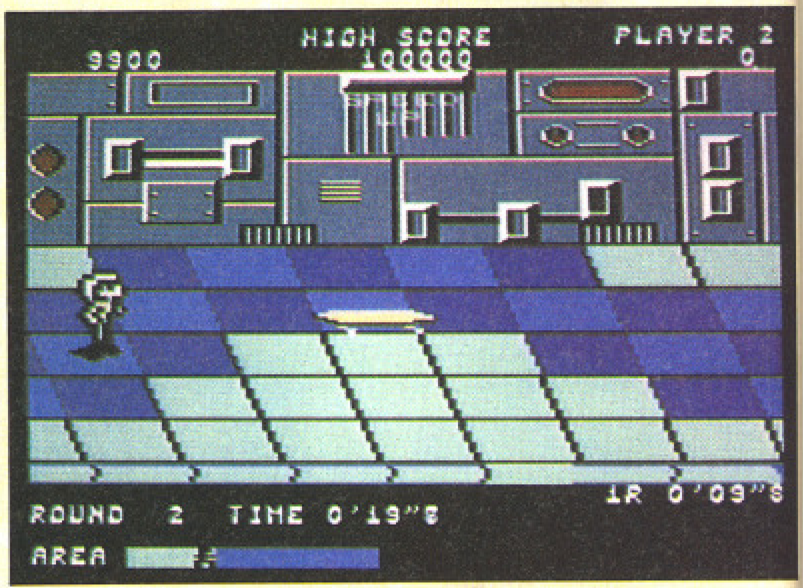
Touchline
Title: *Milk Race.* ***Supplier:*** *Mastertronics, 8-10 Paul Street, London EC2A 4JH.* ***Tel:*** *01-377 6880.* ***Machine:*** *C64.* ***Originality:*** *7/10.* ***Playability:*** *7/10.* ***Graphics:*** *8/10.* ***Value:*** *10/10.*

METROCROSS

I was horrified when I saw the adverts which came out for U.S. Gold's Metrocross. Why is it that I hear you shout?

Well remember Breakthru and Legend of Kage - yes, these are just a few of the dreadful games to come from this company. It seems that nearly every time they release a licenced game (film or arcade) they always make a pig's ear of it.

So you're sitting there now thinking I'm going to tell you what a load of old rubbish Metrocross is? Well you're wrong. I love it, it's really addictive and fun to play. Although there is no story line to speak of as it's such a simple game, this is more than likely what makes it so playable. Anyone could play - even our editor (careful, sonny - Ed).



You are a little man competing in a futuristic race inside an extensive complex. There are also various traps including water holes which if fallen into, will loose you time as you struggle to get out. Then there's the Electro Mats which send you flying as you receive an electric shock. Again these will stun you causing loss of time. Next come the Hurdles which must be avoided or jumped, otherwise you'll end up on the floor losing more time. Green Mats slow you down to a quarter of your normal speed, and other nasties include coke cans (no doubt a sneaky bit of advertising) and rats which cling onto you and must be shaken off or they will slow you down.

On the helpful side there are quite a lot of things such as Springboards which will bounce you a short distance at twice your normal speed. Green Cans speed you along no matter where you are on the screen, but these only last for a short time. Blue Cans can also be found lying around - if you jump on these the clock stops for two seconds (gasp!).

When you negotiate all the traps and make it to the finish line you stop and take a rest. This is quite good as your figure puts its hands on its knees and puffs and blows (just like the arcade). Then it's on to the next round - there are 24 in all. I am very impressed with this excellent conversion. It plays well, the graphics are faithful, if a bit blocky, and the music is almost exact, I'm hooked, so what are you waiting for? Go and buy it now. **K.R.**

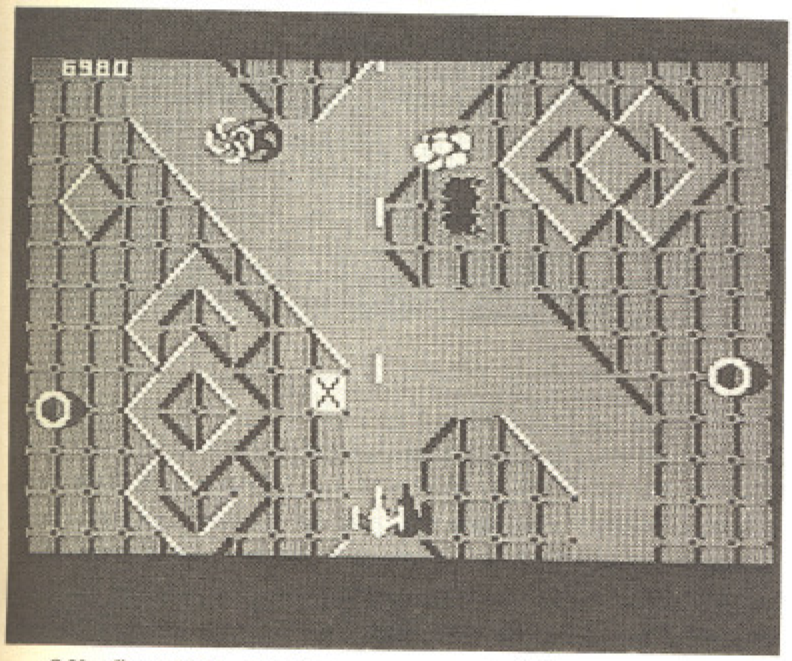
Touchline
Title: *Metrocross.* ***Suppliers:*** *U.S. Gold. Units 2/3 Halford Way, Halford, Birmingham B6 7AX.* ***Tel:*** *021-356 3388.* ***Machine:*** *C64.* ***Price:*** *£9.99.* ***Originality:*** *5/10.* ***Playability:*** *9/10.* ***Graphics:*** *7/10.* ***Value:*** *8/10.*

FIRETRACK

Why is it that most shoot-em-ups are set in the 22nd century? Who cares – it's bad enough reviewing a game that is total rubbish and just another remake of an old game that was crap in the first place, without having to puzzle over

these things. Firetrack is a scrolling shoot-everything-that moves type of game. It contains four different worlds; Baseworld, Dustworld, Iceworld and Mallworld. The individual worlds are known to most people as the Firetracks and they're well known because of the pirates that inhabit them.

At first you think it's another routine mission to wipe out the pirates and their bases, then mission control informs you that somewhere in the Firetracks is a powerful source of energy known as the White Light. The light must be found for if it falls into the hands of the pirates it could mean total destruction of the surrounding planets! So you sup up your last drop of Rosy Lee and jump into your Hachfighter which speeds you off to Save The Universe.



OK, first let's get the moans out of the way. A really annoying 'feature' in this game is the built-in auto-fire. Yes it fires by itself, although it doesn't destroy the gameplay too much. Right - that's my moans out of the way, onto the graphics. They are nice, colourful and detailed, and the aliens are well animated.

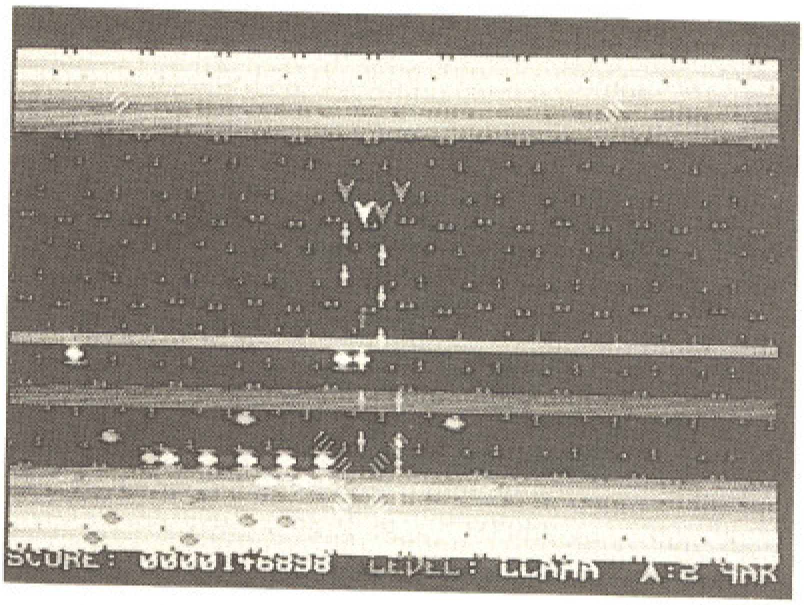
The different worlds are nice and big with a fair bit of variety thrown in for good measure. The end result is a playable and interesting game that doesn't leave a sour taste in the mouth. I think I might as well recommend this, OK? Well done, Electric Dreams - keep it up! **K.R.**

Touchline
Title: *Firetrack.* ***Suppliers:*** *Electric Dreams Terminus House, Terminus Terrace, Southampton, Hampshire SO1 1FE.* ***Tel:*** *0703 229694.* ***Machine:*** *C64.* ***Price:*** *£8.99.* ***Originality:*** *6/10.* ***Playability:*** *8/10.* ***Graphics:*** *7/10.* ***Value:*** *6/10.*

VOIDRUNNER

It's been quite a while since Jeff Minter released a game, his last being Iridis Alpha. This was pretty good and contained his usual mind-blowing colours and totally weird game play.

Well, now Jeff's gone freelance and has written another psychedelic game, this one being a wild freaky shoot-em-up. The blurb on the inlay card is very interesting but when you actually play the game it doesn't seem to tie in.



Years and years ago, back in the 22nd century, there was a famous conflict known to the people of Earth as the Droid Wars. Hundreds of aliens attacked the Earth's power supply grids suspended in space, but they were no match for us and promptly fled. Then one day (about 100 years later), a great telescope is used to monitor the planet, and a great movement of droids is registered. The aliens are planning to nuke Earth. Of course this can't be allowed, so you are carted off to the nearest spaceship and told to wipe out every alien that lives. Some things are more easily said than done.

Your ship consists of one main ship with another three that follow your movements,and fire when you do. The graphics are a bit dated and are made from character blocks, so you can imagine how small they are. Nevertheless this game has an addictive pull to it, though it does't last too long. It's easy to play and you can select the level you wish to start on. Another unusual feature is the way the ship changes formation as you go through the levels and the screens swap around (upside-down etc).

This isn't to my taste, but if you are an out-and-out shoot-em-up freak you might enjoy it, and it's only three quid. **K.R.**

Touchline
Title: *Voidrunner.* ***Supplier:*** *Mastertronic, 8-10 Paul Street, London.* ***Tel: 01-377 6880. Machine:*** *C64.* ***Price:*** *£2.99.* ***Originality:*** *6/10.* ***Playability:*** *6/10.* ***Graphics:*** *4/10.* ***Value:*** *5/10.*

WIZBALL

Well, Ocean have come up tops with this game, I have to say this makes a change. Wizball is quite weird. Don't get me wrong, I am not saying it's rubbish – I'd be lying. You play the part of the wizard who lives on a colourful planet somewhere in space. So there he is minding his own business and admiring the nice landscape, when someone steals his colour!

Yes, the entire planet is now monochrome (yuk!) so being a proud wizard he creates a novel form of transport with powerful offensive weapons, but these need to be bought with credits (I knew it, Nemesis again).

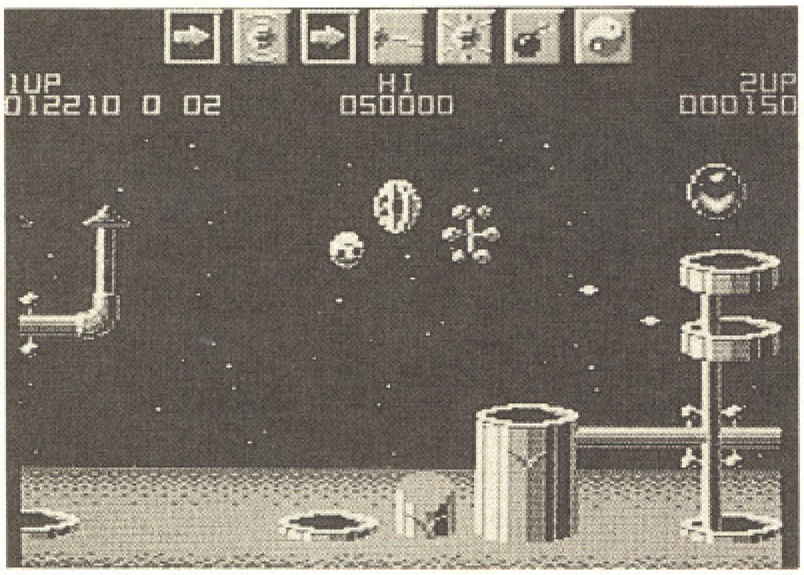
Your Wizball, as the vehicle is known, bounces like a

normal ball. This makes it quite hard to control. Get a credit and you will be given thrust. Another credit gives you anit-gravity – this makes things much better as the ball will now only respond to the joystick instead of bouncing all over the place.

Weapons can now be activated and a Cat called up. The Cat is a small ball which has nine lives, known as a Catellite (moan!). You can also select weapons for your Cat such as multiple firing and a laser. If you want to be real greedy you can hog them for the Wizball. Other weapons include a power beam which will fire above and below your ball.

Next comes the Cat which is a bargain at three credits, then there's the laser, a steal at only four, now the wicked Multi-fire. This awesome gadget will reduce any alien to a smouldering ash pit, now the biggy, yes, The Smart Bomb. This will wipe out any grotty alien with ease, just wiggle the joystick (thats how you select all gadgets) and — POW! — all the meanies are vapourised. A bit pricey at a modest 7 credits is the ultimate in Wizball technology, The Shield. This little baby will keep you and your Cat safe and sound — you can charge about without a worry as aliens burst on impact with you. Sadly, it doesn't last long.

When your're happy with your weapons you can start collecting the colours — to do this you will need a Cat. The colours look like little balls but when shot they release a drop of pigment which must be caught by the Cat before it hits the ground.



At the bottom of the screen are cauldrons. These tell you how much colour you have — each drop of colour is added in. When these are full you are warped off to the bonus stage. Here you can knock your score up vastly and if you manage to last long enough you get the chance to get an extra Wizball!

This game is brill. Stunning graphics, unbelieveable music, compulsive gameplay and excellent presentation. Wizball is sure to reach number one, no sweat.

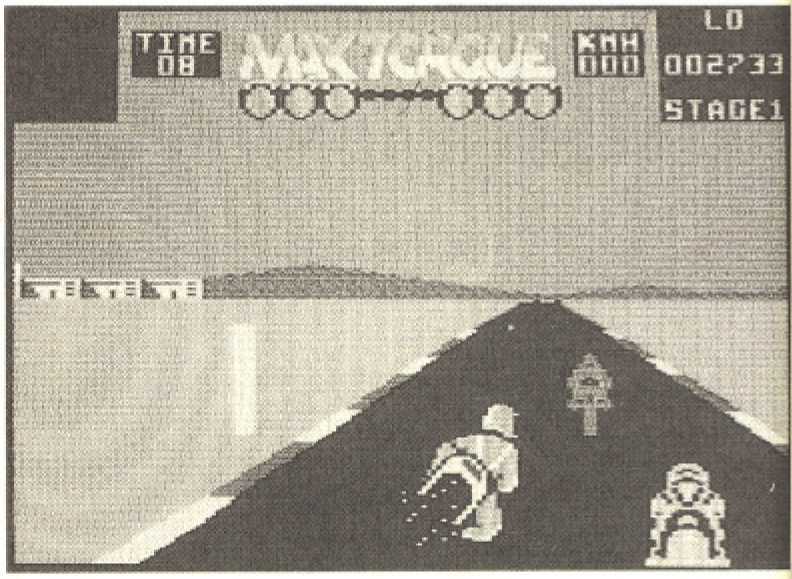
Well done Sensible Software and right on, Ocean, for finding some talented programmers. Please keep it up.

Well don't just sit there reading. Sprint off and buy Wizball. **K.R.**

Touchline
Title: *Wizball.* ***Supplier:*** *Ocean, 6 Central Street, Manchester M2 SN5.* ***Tel:*** *061 832 6633.* ***Price:*** *£8.95 (Cassette) £12.95 (Disk).* ***Originality:*** *9/10.* ***Graphics:*** *10/10.* ***Playability:*** *10/10.* ***Value:*** *10/10.*

MAX TORQUE

No, the title doesn't refer to Max Headroom's younger brother, but rather to a motorbike simulation from Bubble Bus.



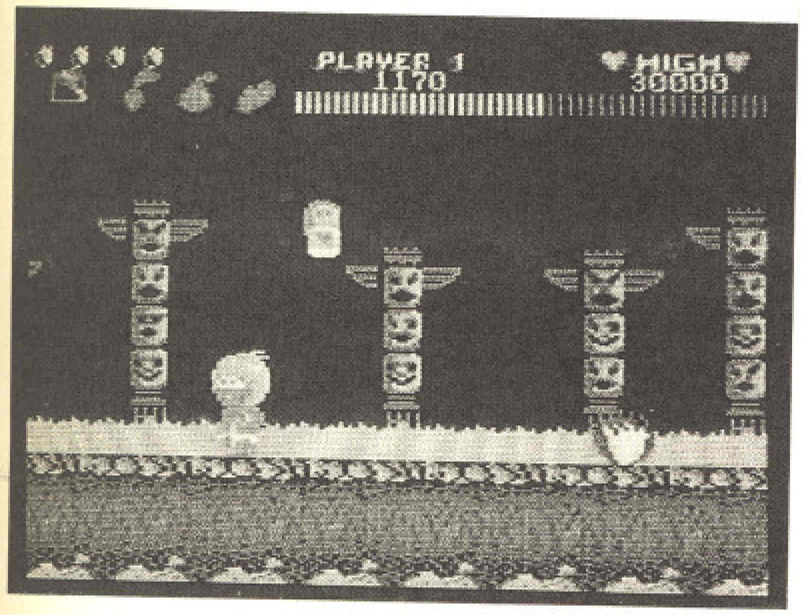
There is the usual course, divided into sections, each of which must be completed within a time limit if you are to progress onto the next stage. One interesting touch, as the authors try to bring a touch of originality to a well worn subject, is that you can choose to control one of seven different riders. Each of these has his own particular skills and weaknesses as does the bike that they ride. In practice though, I failed to notice much of a difference between them but this could say more about the way that I drive rather than anything else.

Controlling the bike is straightforward. Left, right, accelerate and brake with a choice of two gears plus a turbo boost. Your rear lights indicate whether you are braking or accelerating if you can't remember which way you are pushing the joystick. The graphics are large and clear and the game generally handles very well. Enjoyable if you don't already own a motorbike game but not offering anything special if you do. **G.R.H.**

Touchline
Title: *Max Torque.* ***Machine:*** *C64.* ***Supplier:*** *Bubble Bus Software, 87 High Street, Tonbridge, Kent, TN9 IRX.* ***Price:*** *£8-95 (Cassette) £12.95 (Disk).* ***Originality:*** *3/10.* ***Graphics:*** *8/10.* ***Playability:*** *7/10.* ***Value:*** *7/10.*

WONDERBOY

Oh no, not another arcade conversion, this must be about the 321st this week. Those of you who have not been to the arcade will not have seen the brilliant game Wonderboy. The game plot tells of a youth and his girlfriend. One day whilst out walking in their weird land an evil King called, well, King kidnaps the girl and runs off with her.



So our brave little hero sets off to rescue her and defeat the evil King. This is not an easy task as you may guess.

Wonderboy consists of 7 lands, each land divided into 4 sections and each of these four sections consist of another 4 areas (think about it) so our hero has a long way to go before he can finally confront King.

You start off in the jungle, with rocks, rolling boulders, snakes, wasps and snails (pah!) all trying to kill you, then its on to the desert, where killer frogs (ha!) and falling platforms must be negotiated. Backgrounds come in abundance, and very nice they are too.

Scattered around the playing area are various weapons concealed in eggs (eggs?) which have to be broken to find out what is inside. The first egg that you encounter contains a hammer which will give the nasties a good thumping and send them flying. There are also skateboards to be had, but these are sometimes a hinderance as you can not stop dead when riding them.

As you progress through the game, fruit appears regularly and can be picked for bonus points, and if you happen to come across a mushroom this will change all the fruit to junk food (yummy) and give you more time (vitality) on the clock.

I enjoyed playing Wonderboy, and I'm still playing it. So take my advice and buy it. You won't regret it acquiring this excellent arcade conversion.

Three cheers for Activision.

K.R.

Touchline

Name: *Wonderboy.* ***Supplier:*** *Activision, 23 Pound Street, Hampstead, London, NW3 2PN.* ***Tel:*** *01-431 1101.* ***Machine:*** *C64.* ***Price:*** *£9.99 (Cassette).* ***Originality:*** *5/10.* ***Playability:*** *9/10.* ***Graphics:*** *8/10.* ***Value:*** *8/10.*

SPELLSEEKER

Spellseeker is a 3-D maze game with a fantasy setting. The only storyline you are given to guide you is that you must seek out and destroy the evil sorceror Ashlaa.

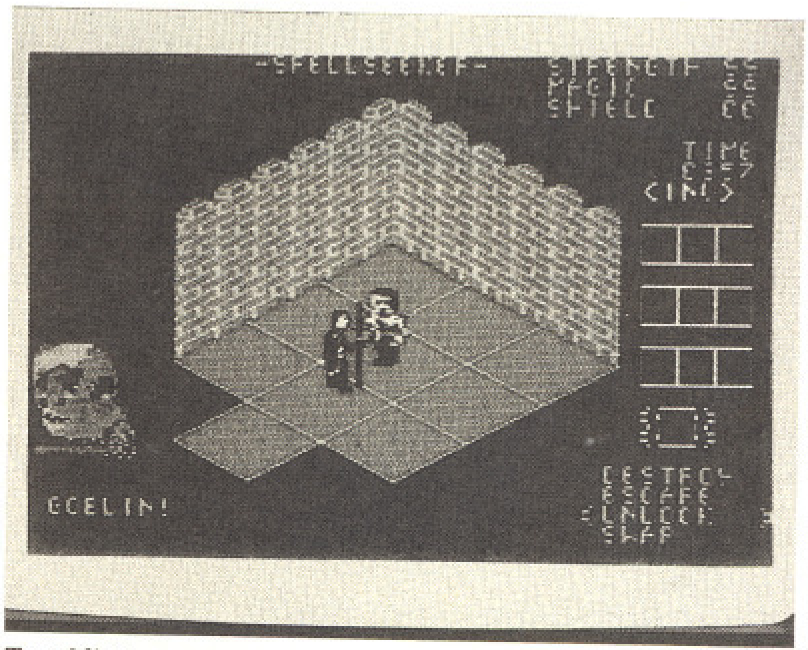
As you wander round the maze, you will find certain objects. Some of these will be found in empty rooms while others will be guarded by one of an assortment of monsters — goblins, witches, vampires and the like. Your only means of defence against these nasties is to cast a spell. Initially, you can only use a 'blast' spell. More potent magics have to be found.

As well as monsters, there are locked and invisible doors, four different types of well — both harmful and beneficial, teleports and vortices. Controlling your character is a simple turn left, turn right and straight on for movement with two function keys being used to scroll through the list of available commands.

The first problem with this game is one of working out just where you are. This is because the game decides to draw everything as your character sees it, rather than how you see it sitting in front of the screen. The results of this are most confusing and just about render the game unplayable — unless you happen to be the sort of person who enjoys mapping and can easily cope with mirror images of rooms. Then there is the fact that nothing seems to happen. You can wander round for long periods of time without meeting anyone or anything. And when you do, the chances are that they will not have anything that you need.

All in all, a very tedious game, let down by some dreadful gameplay. Give it a miss.

G.R.H.



Touchline

Title: *Spellseeker.* ***Machine:*** *C64.* ***Supplier:*** *Bugbyte.* ***Price:*** *£2.99.* ***Originality:*** *4/10.* ***Graphics:*** *1/10.* ***Gameplay:*** *1/10.* ***Value:*** *2/10.*

ZOLYX

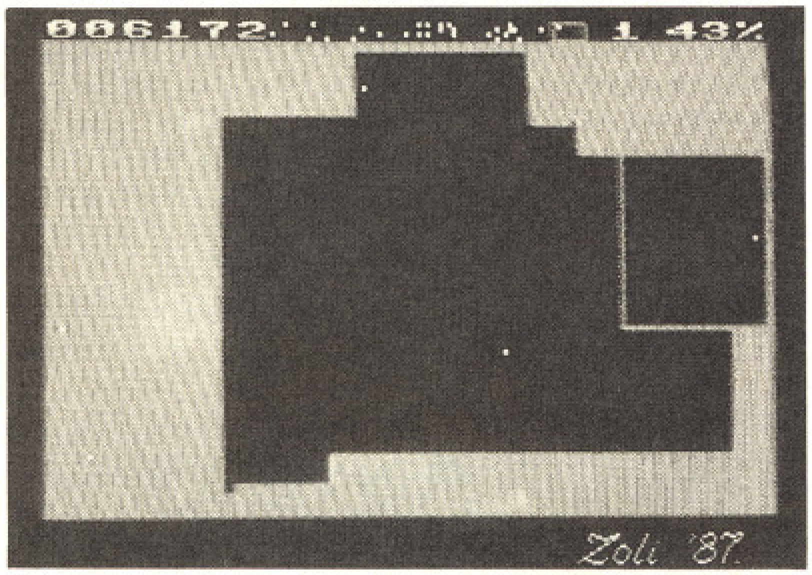
Occasionally, a game comes along that it such a simple idea but is also so infuriatingly addictive that you curse yourself for not having thought of it first. Such a game is Zolyx.

Derived from the 'Painter' type games popular a few years ago, the object of Zolyx is to shade in three quarters of the screen. No more, no less.

You control a cursor which starts off on the edge of the screen. As you move it into the playing area, so it leaves a trail behind it. If you can connect your cursor to safe territory — either the edge of the screen or a previously

constructed block, then the area that you have just defined is filled in.

Naturally, it isn't quite that easy. Small dots move round the screen and background areas and if one of these touches your trail, a life is lost. Likewise if you go back on your own trail. If you trap one of the dots in an area, there is an impasse. The dot remains trapped but you don't fill in the area either. As you progress through the levels, so the number of dots increases. To help you out of a potential pickle, you can reverse the direction of the dots but only once on the first level, twice on the second level etc.



Graphically, the game is dreadful — the colour of the shading doesn't even change when you progress onto the next level. This just goes to show that great graphics aren't the be all and end all of a good game.

For only £1.99, Zolyx will appeal to any strategy fans who will, like me, spend hours working out whether it is better to go for a few large areas or lots of little ones. **G.R.**

Touchline
Title: *Zolyx.* ***Machine:*** *C64.* ***Supplier:*** *Firebird Silver, Wellington House, Upper St. Martin's Lane, London WC2H 9DL.* ***Tel:*** *01-379 6755.* ***Originality:*** *4/10.* ***Graphics:*** *2/10.* ***Playability:*** *9/10.* ***Value:*** *9/10.*

BARBARIAN

And so it came to pass that the evil sorceror Drax proclaimed that he would wreak havoc and doom on the Jewelled City unless the lovely page 3 girl... oops! I mean, the beautiful Princess Maria, was delivered to him.

So the helpless people of the Jewelled City gave in and delivered the princess to him, but being quite a nice guy he said 'I will deliver her back to you on one condition. That is that you can defeat all of my demons'.

Many warriors tried to kill the demons but failed, then from far over the hills came a male model holding a contract. Sorry, a Barbarian holding a huge broadsword. He was the only hope.

You play the part of the Barbarian trying to defeat the evil demons and win back the Princess.

As you might guess, this is a sword combat game. There's a lot of moves and blocks available to the player. A few of the moves include The Web of Death, head butting, kicks to the groin, (ohhhhhhh!), leg chops and the lethal neck chop, which will slice off your opponent's head with a sort-of-chopping-somebody's-head-off sound (really gruesome). The blood spurts out as the body slumps to the ground with a thud and is dragged off by a giggling goblin.

There are two versions of Barbarian. Side one contains a two player I'm-gonna-kill-you practice game, the other contains the real thing in which you do battle with Drax's demons in order to save the princess from a fate worse than death (Dallas?).

I enjoyed Barbarian very much, especially the blood and flying heads bit, and I'm sure that you kids will love it, in fact I'm positive. The two player game is the best part of the package as you can try to beat your Aunt Hilda — until she gives you a deadly neck chop.

All good dirty fun, with good graphics, music and sound effects, and very good gameplay. Stop hitting your gran with that plastic sword and get this game NOW! **K.R.**

Touchline
Title: *Barbarian.* ***Price:*** *£9.99 (Cassette) £12.99 (Cassette).* ***Supplier:*** *Palace Software, 275 Pentonville Road, London B1.* ***Tel: 01-278 0751.*** ***Originality:*** *6/10.* ***Graphics:*** *8/10.* ***Playability:*** *7/10.* ***Value:*** *8/10.*

MAG MAX

After nearly a year of waiting, Imagine have finally released Mag Max, but it looks like it was knocked up in a week. This is not the first time Imagine have cocked up an arcade conversion, and taken a year to do it (remember Mikie?).

Why, oh why, do they insist on doing arcade conversions that they can't handle? This game is dreadful and insults the fab arcade version.

You play the part of a robot, well a bit of one as you are not fully built yet, so you have to find parts of your body which will give you extra firepower.

You trundle across a drab-looking planet surface shooting at ground bases. This bit makes me laugh, as there are bugs galore. For instance sometimes the bases can't be shot — your bullets go straight through them but they still fire at you — and don't be surprised if you find yourself dying for no reason as this happens a lot.

The object of the game is to destroy a huge dragon that waits at the end of each level, which I managed with ease after a few attempts. The graphics are not so bad, but the glitches did annoy me a lot. Ingame there is no music but the title scene sound is great.

This a bit of mixed bag, I'm afraid. It does have good points but these have little addictive pull. Personally I wasn't impressed, but my brother loved it. **K.R.**

Touchline
Name: *Mag Max.* ***Price:*** *£9.99.* ***Machine:*** *C64.* ***Supplier:*** *Imagine, 6 Central Street, Manchester M2 SN5.* ***Tel:*** *061-832 6633.* ***Originality:*** *5/10.* ***Graphics:*** *4/10.* ***Playability:*** *6/10.* ***Value:*** *3/10.*

Universal Number Base Tutor

Many people feel rather daunted when necessity forces them to start thinking in a number base other than 10. Help is at hand with our base tutor program.

By Michael Biddell

Program Breakdown

Line	Description
1	: Set border and paper colours.
2	: Dimension arrays for number conversion and answers to questions in quiz.
7	: Print menu.
8-200	: Convert decimal number to any base up to 16 by repeated division by the chosen base. Lines 80 to 131 are also configured as a subroutine used by other parts of the program.
1000-1200	: Convert any base to decimal. Lines 1070 to 1122 are configured as a subroutine.
4000-4900	: These lines set 10 questions on number base conversions. You are required to convert five numbers from any base into base 10 and five numbers from base 10 into a specified base.
5000-5090	: Print the Menu and get human response.
6500-6550	: Subroutine to check for illegal alphabetical entry in decimal input.
7000-7020	: Print congratulations for perfect score.
7500-7990	: Graphic illustration of number base conversion. Base 10 to any base.
8000-8340	: Convert any base to any base, using base 10 as the common currency. This calls the subroutines at lines 80 to 131 and 1070 to 1122 previously mentiond.
8500-8540	: Subroutine to check for keyboard entry error.
9000-9027	: Routine to check for validity of a number in a particular base.
9900-9910	: Colourful "Goodbye" for Quit.
9950-9970	: Allow only lower case entries from keyboard.
10000-10010	: Print random paper and border.
12000-12010	: Print random ink.
60010-60070	: Emulate 'print at'.
60090-60150	: Emulate 'ink'.
60155	: Prints "Inverse".
60165-60280	: Emulate 'border'.
60290-60380	: Emulate 'paper'.
60390-60470	: Emulate 'beep'.
60490-60500	: Emulate 'pause'.

The number system used by most humans is in base 10, purely because we're gifted with 10 fingers so our rudimentary intelligence latched on to this fact when we first started to count.

Computers, however, have no fingers and communicate using different number methods and this is where many people get confused, because converting from one base to another can seem rather complicated at first.

This is where our Universal Number Base Tutor can come to your aid. It is an educational program which will show you the best methods of converting from one base to another (up to hexadecimal) as well as providing practice and a quiz for you to test yourself.

Aims

This educational program was designed with the following objectives:

1. Convert decimal (denary) to any base.
2. Convert any base to denary.
3. Convert any base to any base (up to 16).
4. Demonstrate clearly how number base conversion is carried out.
5. Test understanding.

All these objectives have been achieved in the program.

With the increasing need to understand number bases fully under the modern maths approach, the program may well find application in schools as well as the home.

It is written in pure Microsoft Basic, on a modular basis and should therefore, be easy to understand.

Number Base Tutor was originally written for the Spectrum and many Commodore users will see in it a novel and simple way of converting Spectrum listings for use on the C64.

Program Structure

The use of 'ink', 'paper', 'print at' and 'border' subroutines etc. has produced a very legible Commodore listing, free from many special Commodore control characters, it is therefore especially easy to type in. These subroutines can be used in readers' own programs to produce many colourful moving graphic effects.

```
PROGRAM: NUMBER BASE

F3   1 BDR-0:GOSUB 60200:PPR-0:GO
     SUB 60300:PRINT CHR$(147)
FE   2 DIMT(5):DIMN$(12):DIMN(5):
     DIMB(5):DIMP$(5):DIMVE(5):DI
     MW$(5):DIMX(5)
14   5 C-48:PRINTCHR$(14)
DD   6 M$-""
2B   7 GOTO 5000
FD   8 PRINT CHR$(147)
DE   9 M$-""
07   10 C-48
7F   11 FOR J-1 TO 12:N$(J)-"":NE
     XTJ
29   12 GOSUB 5500
BD   20 Y-3:X-0:INK-2:IV-1:GOSUB6
     0000:PRINT"[SI]NPUT NUMBER I
     N DECIMAL.(INTEGERS ONLY)"
22   25 INPUT C$:GOSUB 8500:S-VAL
      (C$):N-S
77   28 PRINT:PRINT:PRINT"[SD,SE,
     SC,SI,SM,SA,SL,SSPC,SN,SU,SM
     ,SB,SE,SR]-";N
0B   30 PRINT:PRINT:PRINT
D3   40 INK-6:GOSUB60090:PRINT"[S
     T,SO] [SW,SH,SI,SC,SH,SSPC,S
     B,SA,SS,SE]?"
9B   50 INPUT C$:GOSUB 8500:B=VAL
     (C$)
7A   51 IF B<2 OR B>16 THEN GOTO
     50
01   52 PRINT:PRINT:PRINT:INK-4:G
     OSUB60090:PRINT"[SB,SA,SS,SE
     ]-";B
32   55 PRINT:PRINT:PRINT
1D   56 GOSUB 80
25   57 GOTO 140
32   80 FOR J-1 TO 12:N$(J)-"":NE
     XTJ
01   82 FOR J-1 TO 12
0F   100 X-N/B
89   101 IF X-0 THEN GOTO 120
B1   102 Y-N-(INT(X)*B)
6D   103 IF Y>9 THEN C-55
7C   104 IF Y<-9 THEN C-48
F5   105 N-INT(X)
E9   108 N$(J)-CHR$(C+Y)
46   110 NEXT J
7E   120 FOR J-12 TO 1 STEP -1
B4   122 IF N$(J)-" " THEN GOTO 1
     30
CD   126 M$-M$+N$(J)
6A   130 NEXT J
0D   131 RETURN
12   140 INK=5:IV-0:GOSUB60090:PR
     INT"[SD,SE,SC,SI,SM,SA,SL] "
     ;S;" [SI,SN,SSPC,SB,SA,SS,SE
     ,SSPC]";B;" -";M$
31   141 GOSUB10000
07   150 PSE-100:GOSUB 60500
02   155 PRINT
E4   160 INK-7:GOSUB 60090:PRINT"
     [SP]RESS C TO CONTINUE."
0F   170 INK-6:GOSUB 60090:PRINT"
     PRESS R TO RETURN TO MENU."
8D   175 GET G$
C1   176 IF G$-"C" THEN GOTO 8
DD   190 IF G$-"R" THEN GOTO 7
B2   200 GOTO 175
74   1000 PRINT CHR$(147):GOSUB 5
     500:F1-0
5C   1001 V-0
6B   1002 E-1
5A   1003 NUM-0
6D   1004 D-0
52   1005 Y-3:X-0:INK-2:IV-1:GOSU
     B60000:PRINT"[SI]NPUT BASE Y
     OU ARE WORKING IN."
B2   1010 INPUT C$:GOSUB 8500:S-V
     AL(C$):N-S
4A   1020 IF N<1 OR N>16 THEN GOT
     O 1010
4B   1040 PRINT:PRINT:INK-6:GOSUB
     60090:PRINT"[SN,SU,SM,SB,SE,
     SR,SSPC,SB,SA,SS,SE]-";N
C4   1045 PRINT:PRINT:PRINT
9D   1050 INK-4:GOSUB60090:PRINT"
     [SI,SN,SP,SU,ST,SSPC,SN,SU,S
     M,SB,SE,SR] [SI,SN,SSPC,SB,S
     A,SS,SE,SSPC]";N
B3   1060 INPUT B$
A2   1062 IF B$-"" THEN GOTO1060
AC   1065 GOSUB 1070:GOTO 1125
47   1070 C-LEN(B$)
1C   1071 FOR J-1 TO C
0B   1072 IF ASC(MID$(B$,J,1))>57
      THEN GOTO 1074
5A   1073 IF VAL(MID$(B$,J,1))>N-
     1 THEN GOTO 9000
E0   1074 IF ASC(MID$(B$,J,1))<15
     9AND ASC(MID$(B$,J,1))>192 T
     HEN GOTO 9950
03   1075 IF ASC(MID$(B$,J,1))-54
     >N  THEN GOTO 9000
04   1076 NEXTJ
F0   1080 FOR J-C TO 1 STEP-1
D5   1082 IF ASC(MID$(B$,J,1))>64
      AND ASC(MID$(B$,J,1))<71  T
     HEN V-55
96   1083 IF ASC(MID$(B$,J,1))>-4
     8 AND ASC(MID$(B$,J,1))<-57
     THEN V-48
9A   1090 D-(ASC(MID$(B$,J,1))-V)
     *E
60   1100 E-E*N
0E   1110 NUM-NUM+D
4C   1120 NEXT J
E8   1122 RETURN
37   1125 PRINT:PRINT:PRINT:PRINT
B4   1126 PRINT:PRINT
F2   1127 PRINT
EF   1128 IV-0:GOSUB60090
69   1130 INK-2:GOSUB 60090:PRINT
     B$;" [SI,SN,SSPC,SB,SA,SS,SE
     ,SSPC]";N;" - ";NUM;" DEC."
2E   1135 GOSUB10000:PRINT
9D   1136 PSE-100:GOSUB60500
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```
E4  1180 INK=7:GOSUB 60090:PRINT
    "[SP]RESS C TO CONTINUE."
0F  1190 INK=6:GOSUB 60090:PRINT
    "PRESS R TO RETURN TO MENU."
91  1191 GET G$
EE  1192 IF G$="C" THEN GOTO 100
    0
94  1193 IF G$="R" THEN GOTO 7
D5  1200 GOTO 1191
29  4000 PRINT CHR$(147):INK=6:G
    OSUB 60090:PRINT"[SN,SU,SM,S
    B,SE,SR,SSPC,SB,SA,SS,SE,SSP
    C,SC,SO,SN,SV,SE,SR,SS,SI,SO
    ,SN,SSPC,ST,SE,SS,ST]."
4C  4001 IV=1:GOSUB60090:GOSUB10
    000:PRINT"[SA]NSWER THE FOLL
    OWING QUESTIONS."
1E  4002 IV=0:GOSUB60090
7C  4003 PRINT:PRINT"TAKE AS MUC
    H TIME AS YOU NEED ---USE[SP
    C4]PENCIL AND "
74  4004 PRINT"PAPER TO WORK OUT
     YOUR ANSWERS----THE[SPC3]OB
    JECTIVE IS A PERFECT SCORE"
BC  4005 IV=1:GOSUB60090
E0  4006 PRINT:PRINT:GOSUB10000:
    PRINT"[SC,SO,SN,ST,SI,SN,SU,
    SE,SSPC,SW,SI,ST,SH,SSPC,ST,
    SH,SE,SSPC,SE,SX,SE,SR,SC,SI
    ,SS,SE,SSPC,SI,SF,SSPC,SY,SO
    ,SU,SSPC,SG,SE,ST]  "
C5  4007 PRINT CHR$(18)"[SPC10,S
    A,SN,SY,SSPC,SW,SR,SO,SN,SG]
    .[SPC19]":PSE=150:GOSUB60500
B9  4008 FOR K= 1 TO 5
EF  4009 M$=""
E6  4010 N=INT(RND(1)*20)+2
BF  4020 B=INT(RND(1)*14)+2
E1  4022 N(K)=N
FF  4024 B(K)=B
8B  4030 GOSUB 80
F8  4040 P$(K)=M$
C8  4050 NEXT K
10  4060 FOR K3=1 TO 5
B5  4062 V=0:E=1:NUM=0:D=0
7E  4070 N=INT(RND(1)*15)+2
47  4080 VE(K3)=N
23  4085 M$=""
EC  4090 FOR L3=1 TO 2
6B  4100 M$=M$+STR$(INT(RND(1)*N
    -1)+1)
23  4110 NEXT L3
2D  4120 W$(K3)=M$
5A  4122 B=VAL(M$):B$=STR$(B)
4A  4123 B$=RIGHT$(B$,(LEN(B$)-1
    ))
57  4140 GOSUB 1070
E7  4150 X(K3)=NUM
EC  4160 NEXT K3
8B  4170 S=0
00  4200 FOR K2=1 TO 5
62  4205 PRINT CHR$(147)
A4  4206 GOSUB10000
BC  4210 Y=10:X=6:INK=3:IV=0:GOS
    UB60000:PRINTN(K2);" IS A DE
    CIMAL NUMBER"
F6  4220 Y=12:X=6:GOSUB60000:PRI
    NT"[SW]HAT IS IT IN BASE ";B
    (K2);"?"
96  4230 INPUT A$
60  4235 IF A$="" THEN GOTO 4230
72  4240 IF A$=LEFT$(P$(K2),LEN(
    A$)) THEN S=S+1
B4  4246 Y=16:X=6:INK=6:GOSUB600
    00:PRINT"[SA,SN,SS,SW,SE,SR]
    =";P$(K2)
FC  4247 Y=18:X=6:INK=6:GOSUB600
    00:PRINT"[SY,SO,SU,SR] [SR,S
    E,SS,SP,SO,SN,SS,SE]=";A$:PS
    E=200:GOSUB 60500
35  4250 NEXT K2
2B  4260 FOR K5=1 TO 5
23  4270 PRINT CHR$(147)
7F  4275 GOSUB10000
C0  4280 Y=10:X=6:INK=4:GOSUB 60
    000:PRINTVAL(W$(K5));" IS A
    BASE ";VE(K5);" NUMBER"
97  4290 Y=12:X=6:INK=7:GOSUB600
    00:PRINT"[SW]HAT IS IT IN DE
    CIMAL?"
5C  4300 INPUT A$
0F  4310 IF A$="" THEN GOTO 4300
A3  4320 IF VAL(A$)=X(K5) THEN S
    =S+1
CA  4332 Y=16:X=6:INK=5:GOSUB600
    00:PRINT"[SA,SN,SS,SW,SE,SR]
    =";X(K5)
D0  4334 Y=18:X=6:INK=4:GOSUB600
    00:PRINT"[SY,SO,SU,SR] [SR,S
    E,SS,SP,SO,SN,SS,SE]=";VAL(A
    $):PSE=100:GOSUB 60500
1C  4350 NEXT K5
ED  4360 IF S=10 THEN GOSUB 7000
B7  4370 PRINT CHR$(147):X=6:GOS
    UB 60000:PRINT"[SI,SM,SP,SE,
    SR,SF,SE,SC,ST,SSPC,SS,SC,SO
    ,SR,SE]---TRY AGAIN."
19  4380 FORJ=1 TO 10:GOSUB10000
    :GOSUB60400:NEXTJ:RUN
A7  4900 STOP
E1  5000 BDR=0:GOSUB 60200:PPR=0
    :GOSUB 60300:PRINT CHR$(147)
91  5001 GOSUB10000:PRINT
09  5002 Y=0:X=0:IV=1:GOSUB60000
    :PRINT"[SPC5,SSPC,SU,SN,SI,S
    V,SE,SR,SS,SA,SL,SSPC,SN,SU,
    SM,SB,SE,SR,SSPC,SB,SA,SS,SE
    ,SSPC,ST,SU,ST,SO,SR,SPC6]"
7D  5005 GOSUB10000:PRINT
C7  5010 PRINT"1.[SC]ONVERT DECI
    MAL TO ANY BASE."
02  5015 GOSUB 60400:GOSUB10000:
    PRINT
4C  5020 PRINT"2.[SC]ONVERT ANY
    BASE TO DECIMAL."
FC  5025 GOSUB 60400:GOSUB10000:
    PRINT
EB  5030 PRINT"3.[SC]ONVERT ANY
    BASE TO ANY BASE."
16  5035 GOSUB 60400:GOSUB10000:
    PRINT
22  5040 PRINT"4.[SV,SA,SL,SI,SD
    ,SA,ST,SI,SO,SN]/[SE,SV,SA,S
    L,SU,SA,ST,SI,SO,SN,SSPC,ST,
    SE,SS,ST]."
10  5045 GOSUB 60400:GOSUB10000:
    PRINT
0F  5047 PRINT"5.[SN]UMBER BASE
    DEMONSTRATION."
27  5048 GOSUB 60400:GOSUB10000:
    PRINT
33  5050 PRINT"6.[SQ,SU,SI,ST] "
1B  5052 GOSUB 60400:GOSUB10000:
    PRINT
C0  5055 PRINT"[SP]RESS NUMBER O
    F YOUR CHOICE."
4A  5056 PRINT
E4  5060 GOSUB 5500
E0  5065 GETG$
7E  5070 IF G$="1" THEN GOTO 8
FF  5075 IF G$="2" THEN GOTO 100
    0
82  5080 IF G$="3" THEN GOTO 800
    0
D6  5085 IF G$="4" THEN GOTO 400
    0
DC  5086 IF G$="5" THEN GOTO 750
    0
D6  5087 IF G$="6" THEN GOTO 990
    0
24  5090 GOTO 5065
F0  5500 GOSUB60400:PRINT:PRINT:
    RETURN
4E  6000 FOR J=1 TO LEN (A$)
5A  6010 C=ASC(MID$(A$,J,1))
EE  6020 IF C>96 AND C<122 THEN
    MID$(A$,J,1)=CHR$(C-32)
0D  6030 NEXT J
21  6040 RETURN
42  6500 FOR J=1 TO LEN(A$)
54  6510 C=ASC(MID$(A$,J,1))
FC  6520 IF C>57 OR C<48 THEN Y=
    0:X=7:INK=2:IV=1:PRINT"[SI,S
    L2,SE,SG,SA,SL,SSPC,SA,SL,SP
    ,SH,SA,SB,SE,ST,SI,SC,SA,SL,
    SSPC,SE,SN,ST,SR,SY]"
78  6530 IF C>57 OR C<48 THEN GO
    TO 4280
0D  6540 NEXT J
21  6550 RETURN
B3  7000 PRINT CHR$(147):S$="[SW
    ,SE,SL2,SSPC,SD,SO,SN,SE,SSP
    C,SP,SE,SR,SF,SE,SC,ST,SSPC,
    SS,SC,SO,SR,SE]--[SS,SE,SL,S
    E,SC,ST,SSPC,SQ,SU,SI,ST]...
    "
AA  7001 GOSUB10000
CB  7002 FOR J=1 TO LEN(S$)
AE  7003 X=40-J:Y=10:IV=1:GOSUB6
    0000:PRINTMID$(S$,1,J)
5F  7004 NEXT J
C8  7010 FOR J=1 TO 10:GOSUB1000
    0:NEXTJ
0D  7020 RUN
5E  7500 PRINT CHR$(147)
D0  7501 Y=0:X=0:INK=7:IV=1:GOSU
    B 60000:PRINT"[SN]UMBER BASE
     DEMO---UP TO BASE TEN."
03  7510 R=30:S=4
43  7515 IV=0:GOSUB60090
29  7520 FOR K=0 TO 4
AF  7525 GOSUB 5500
AA  7530 Y=S:X=R:INK=6:GOSUB6000
    0:PRINTK
77  7540 R=R-K-3
72  7550 NEXT K
27  7560 Y=4:X=0:INK=2:GOSUB6000
    0:PRINT"[SP]OWER:"
86  7570 Y=18:X=0:INK=4:GOSUB600
    00:PRINT"[SW]HICH BASE?"
36  7575 INPUT C$
38  7580 GOSUB 8500:N=VAL(C$)
22  7590 IF N<2 OR N>10 THEN GOT
    O 7570
02  7600 Y=5:X=0:INK=5:GOSUB 600
    00:PRINT"[SB]ASE:";N
19  7605 R=29:S=5
4F  7610 FOR K=0 TO 4
BB  7620 Y=S:X=R:INK=5:GOSUB6000
    0:PRINTN
0C  7625 R=R-K-3
C2  7630 NEXT K
17  7640 INK=7:GOSUB60090:PRINT"
    [C@39]"
93  7645 R=29:S=7
EF  7650 FOR K= 0 TO 4
87  7660 Y=S:X=R:INK=3:GOSUB6000
    0:PRINTINT(N^K)
DB  7661 T(K+1)=INT(N^K)
C6  7662 Y=S+1:X=R+1:INK=7:GOSUB
    60000:PRINT"[SX]"
C4  7665 R=R-K-3
FA  7670 NEXT K
5A  7680 Y=7:X=0:INK=7:GOSUB6000
    0:PRINT"[SD]ECIMAL:"
96  7681 Y=9:X=0:INK=2:GOSUB 600
    00:PRINT"[SN]UMBER:"
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53  7683 Y=11:X=0:INK=5:GOSUB600
    00:PRINT"[SP]RODUCTS:"
ED  7684 Y=10:X=0:INK=7:GOSUB600
    00:PRINT"[C@39]"
3C  7690 Y=20:X=0:INK=6:GOSUB600
    00:PRINT"[SI]NPUT NUMBER IN
    THIS BASE."
0F  7695 INPUT C$:GOSUB 8500
EB  7700 B$=C$:C=LEN(C$)
3C  7702 IF LEN(C$)>5 THEN GOTO
    7690
1D  7703 V=0:E=1:NUM=0:D=0
57  7710 GOSUB 1070
32  7715 R=29:Y=10
85  7720 FOR K=0 TO C-1
9F  7730 Y=S+2:X=R+1:INK=4:GOSUB
    60000:PRINTMID$(C$,C,1)
FB  7732 Y=S+4:X=R:INK=4:GOSUB60
    000:PRINTVAL(MID$(C$,C,1))*T
    (K+1)
B0  7740 R=R-K-3
09  7745 C=C-1
4D  7750 NEXT K
7B  7760 Y=16:X=0:INK=5:GOSUB600
    00:PRINT"[ST]HEREFORE DECIMA
    L NUMBER=";NUM
25  7770 PSE=100:GOSUB 60500
8F  7775 PRINT:PRINT:PRINT:PRINT
    :PRINT:PRINT
59  7780 GOSUB10000:PRINT"[SP]RE
    SS C TO CONTINUE."
A7  7790 GOSUB 10000:PRINT"[SP]R
    ESS R TO RETURN TO MENU."
34  7800 GET G$
44  7805 IF G$="C" THEN GOTO 750
    0
2D  7810 IF G$="R" THEN GOTO 500
    0
CC  7820 GOTO 7800
C5  7990 STOP
18  8000 PRINT CHR$(147):GOSUB 5
    500:F1=0
71  8001 V=0:M$=""
E7  8002 E=1
4E  8003 NUM=0
E9  8004 D=0
9C  8005 Y=3:X=0:INK=2:IV=1:GOSU
    B 60000:PRINT"[SI]NPUT BASE
    YOU ARE WORKING IN."
36  8010 INPUT C$:GOSUB 8500:S=V
    AL(C$):N=S
96  8020 IF N<2 OR N>16 THEN GOT
    O 8010
BD  8040 PRINT:PRINT:INK=5:GOSUB
     60090:PRINT"[SN,SU,SM,SB,SE
    ,SR,SSPC,SB,SA,SS,SE]=";N
15  8045 PRINT
70  8050 INK=6:GOSUB60090:PRINT"
    [SI,SN,SP,SU,ST,SSPC,SN,SU,S
    M,SB,SE,SR,SSPC,SI,SN,SSPC,S
    B,SA,SS,SE,SSPC]";N
FE  8052 B1=N
95  8055 INPUT B$
92  8056 INK=4:GOSUB60090:PRINTB
    $
CB  8065 GOSUB 1070
DE  8066 G$=B$
12  8125 N=NUM
B8  8126 PRINT:PRINT:PRINT
F6  8130 INK=2:GOSUB60090:PRINT"
    [ST,SO,SSPC,SW,SH,SI,SC,SH,S
    SPC,SB,SA,SS,SE]?"
7F  8135 PRINT
DC  8140 INPUT C$:GOSUB 8500:B=V
    AL(C$)
1C  8150 IF B<2 OR B>16 THEN GOT
    O 50
88  8160 INK=5:GOSUB60090:PRINT"
    [SB,SA,SS,SE]=";B
4E  8165 PRINT:PRINT
CC  8170 GOSUB 80
19  8190 INK=4:IV=0:GOSUB60090:P
    RINTG$;" [SI,SN,SSPC,SB,SA,S
    S,SE,SSPC]";B1
23  8195 INK=4:IV=0:GOSUB 60090:
    PRINT;"=";M$;" [SI,SN,SSPC,S
    B,SA,SS,SE,SSPC]";B
5A  8196 GOSUB10000
D5  8200 PSE=100:GOSUB 60500
7C  8210 PRINT:PRINT
9C  8300 INK=7:GOSUB60090:PRINT"
    [SP]RESS C TO CONTINUE."
6B  8310 INK=6:GOSUB60090:PRINT"
    [SP]RESS R TO RETURN TO MENU
    ."
8A  8320 GET G$
3C  8325 IF G$="C" THEN GOTO 800
    0
DF  8330 IF G$="R" THEN GOTO 500
    0
DA  8340 GOTO 8320
26  8500 F1=0
46  8502 IF C$=""THEN GOTO 5000
FA  8505 FOR K= 1 TO LEN(C$)
B1  8510 IF ASC(MID$(C$,K,1))>57
     OR ASC(MID$(C$,K,1))<48 THE
    N F1=1
50  8520 IF F1=1 THEN Y=0:X=7:IN
    K=2:IV=1:GOSUB60000:PRINT"[S
    I,SL2,SE,SG,SA,SL,SSPC,SK,SE
    ,SY,SSPC,SB,SO,SA,SR,SD,SSPC
    ,SE,SN,ST,SR,SY]"
35  8521 IF F1=1THEN PSE=100:GOS
    UB60500
CB  8522 IF F1=1 THEN GOTO 5000
5A  8530 NEXT K
F3  8540 RETURN
29  9000 PRINT CHR$(147):GOSUB 5
    500
A6  9010 INK=2:GOSUB 60090:PRINT
    "[SN,SU,SM,SB,SE,SR,SSPC,ST,
    SY,SP,SE,SD],[SN,SO,ST,SSPC,
    SV,SA,SL,SI,SD,SSPC,SI,SN,SS
    PC,ST,SH,SI,SS,SSPC,SB,SA,SS
    ,SE]"
8E  9022 GOSUB 5500
8F  9023 X=5:Y=4:INK=7:GOSUB6000
    0:PRINT"[SP]RESS ANY KEY TO
    RESTART."
28  9025 GETG$
2B  9026 IF G$="" THEN GOTO 9025
8A  9027 GOTO 5000
57  9900 PRINT CHR$(147)
4E  9901 FOR J=1 TO 100
08  9902 GOSUB12000
38  9905 PRINT"[SPC11,SG,SO2,SD,
    SB,SY,SE,SSPC7,SPC6]";
30  9906 NEXT J
E4  9910 GOTO 9910
85  9950 Y=0:X=0:INK=2:GOSUB6000
    0:PRINT"[SPC3,SL]OWER CASE L
    ETTERS ONLY PLEASE.[SPC5]"
70  9955 Y=1:X=0:INK=2:GOSUB6000
    0:PRINT"[SPC4,SR]ESTART AFTE
    R RETURN TO MENU.[SPC6]"
11  9960 GOSUB 60400
BE  9965 PSE=100:GOSUB60500
92  9970 RUN
9D  10000 FOR I1=7 TO 0STEP-1:PP
    R=I1:GOSUB60300:BDR=I1:GOSUB
    60200
F7  10005 INK=INT(RND(1)*7)+1:GO
    SUB60090
F9  10010 NEXTI1:RETURN
19  12000 INK=INT(RND(1)*7)+1:GO
    SUB60090
96  12010 RETURN
83  50000 STOP
21  60000 REM*EMULATE PRINT AT,
    INK AND INVERSE.
B5  60010 PRINT CHR$(19)
5A  60015 IF Y=0 THEN GOTO 60050
CD  60020 FOR J8=1 TO  Y
6A  60030 PRINT CHR$(17);
92  60040 NEXT J8
A7  60045 IF X=0 THEN GOTO 60090
0F  60050 FOR J9=1 TO  X
9D  60060 PRINT CHR$(29);
B1  60070 NEXT J9
61  60090 IF INK=0 THEN PRINT CH
    R$(144);
73  60100 IF INK=1 THEN PRINT CH
    R$(31);
60  60110 IF INK=2 THEN PRINT CH
    R$(28);
53  60120 IF INK=3 THEN PRINT CH
    R$(156);
61  60130 IF INK=4 THEN PRINT CH
    R$(30);
D8  60140 IF INK=5 THEN PRINT CH
    R$(159);
BD  60145 IF INK=6 THEN PRINTCHR
    $(158);
DC  60150 IF INK=7 THEN PRINT CH
    R$(5);
7C  60155 IF IV=1 THENPRINT CHR$
    (18);
65  60160 RETURN
54  60165 REM *EMULATE BORDER
10  60200 IF BDR=0 THEN POKE 532
    80,0
2B  60210 IF BDR=1 THEN POKE 532
    80,6
2D  60220 IF BDR=3 THEN POKE 532
    80,4
BF  60230 IF BDR=4 THEN POKE 532
    80,5
CC  60240 IF BDR=5 THEN POKE 532
    80,3
6E  60250 IF BDR=7 THEN POKE 532
    80,1
60  60260 IF BDR=2  THEN POKE 53
    280,2
F7  60270 IF BDR=6  THEN POKE 53
    280,7
ED  60280 RETURN
C9  60290 REM *EMULATE PAPER
9F  60300 IF PPR=0 THEN POKE 532
    81,0
A0  60310 IF PPR=1 THEN POKE 532
    81,6
BE  60320 IF PPR=3 THEN POKE 532
    81,4
F0  60330 IF PPR=4 THEN POKE 532
    81,5
AF  60340 IF PPR=5 THEN POKE 532
    81,3
D5  60350 IF PPR=7 THEN POKE 532
    81,1
93  60360 IF PPR=2  THEN POKE 53
    281,2
0E  60370 IF PPR=6  THEN POKE 53
    281,7
49  60380 RETURN
31  60390 REM *EMULATE BEEP
8F  60400 FOR K8= 1 TO 10
84  60405 V1=54296:W1=54276:A1=5
    4277:HF=54273:LF=54272:SU=54
    278:PH=54275:PL=54274
2A  60410 POKE V1,15:POKE W1,17
    :POKE A1,190:POKE PH,15:POKE
    PL,15:POKE SU,240
28  60420 POKE LF,RND(0)*254
2E  60422 POKE HF,RND(0)*254
87  60426 NEXTK8
8B  60460 POKE HF,0:POKE LF,0:PO
    KE W1,0:POKE A1,0:POKE SU,0
AC  60470 RETURN
A2  60490 REM* EMULATE PAUSE
38  60500 FORK9=1 TO PSE*20 :NEX
    TK9:RETURN
```

C16 Sprite

Does your C16 lack a little something? Then add sprites with this useful utility.

By Frank Bingley

When I first acquired a Commodore 16, I was impressed by the improvements made to Commodore basic. But it wasn't too long before it dawned on me that Commodore had forgot one important feature which 64 owner's had come to take for granted. It didn't support sprites!

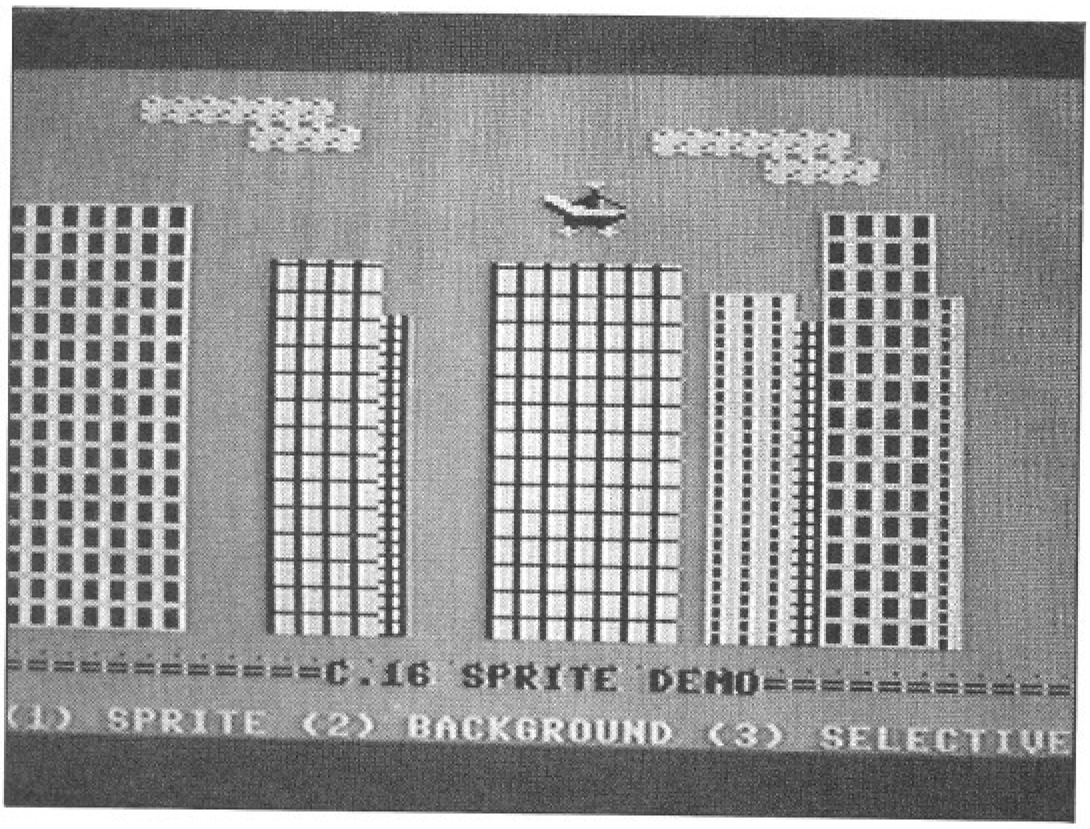
For most serious applications and general computer use, the computer performed quite adequately. It was only when I came to games programing that this missing feature became something of a problem. The only way possible to move object blocks of any size around the screen was to incorporate the necessary characters into a string, along with complicated control characters. These strings were then guided around using the handy CHAR command. This worked reasonably well, but suffered from screen scrolling problems and wiped out any other characters that got in the way!

These problems prompted me to write a machine code routine which would, to some extent, mimmick the sprite facility on the 64. **C16 SPRITE** is an interupt-driven routine with which it is possible to display a six character sprite anywhere on the screen. Certain pokes will instantly move the sprite around whilst others control which sprite data block is displayed as well as sprite to background priority. Other features are collision detection and selective priority (not found on the 64).

Along with notes on how to use this utility, I've included a short basic program which demonstrates how easy the system is. Equally good results can be obtained by using this routine as part of a basic or machine code program. To effectively use **C16 SPRITE**, it will be necessary to know briefly how the routine works. A block of six characters (3 wide by 2 deep) will be displayed on the screen. Their position will be determined by two addresses which hold their X and Y co-ordinates. The actual characters (and colours) displayed will be held in a sprite block buffer, just above the utility. Another address will hold the sprite block number. The sprite will be displayed either behind or in front of any other characters on the screen according to the contents of two other addresses. The system automatically remembers what characters and colours lie beneath the sprite, and replaces them when the sprite is moved or turned off.

Table 1 shows which addresses do what.

HEX	DEC	DESCRIPTION
$3E44	1594Ø	X Position
$3E45	15941	Y Position
$3E6D	15981	Sprite to background priority
$3E6E	15982	Priority end character
$3E6F	15983	Collision detection
$3E72	15986	Sprite block pointer
$3CØØ-$3EE9	1536Ø-163Ø5	C16 SPRITE utility resides here
$3FØØ-$3FFF	16128-16383	Sprite data buffer
SYS DEC ("3E95")		Turn on sprite
SYS DEC ("3E75")		Turn off sprite



Typing in C16 Sprite

Type in listing 1 as it appears and save to tape or disk after correcting any errors. Now run the program. Next, with the data in place, enter the monitor and save a boot-load version by typing:
S 'C16. SPRITE',08,3C00,3EE9
Remember to use 01 instead of 08 if using tape.

How To Use C16 Sprite

Let's test the system. First protect the utility from being overwritten by Basic. To do this type:
POKE 52,47:POKE 56,47:CLR
Now load 'C16 SPRITE' by entering monitor and typing:
L 'C16. SPRITE',08
Tape users will need to position the tape at the beginning of the utility before this command.

Next, we need to form a sprite. Either the standard character set or user defined graphics may be used, but for this exercise let's keep it simple! Our test sprite will be a red reverse block.

At this point, I will explain how the sprite data is stored in the buffer. The buffer is divided into 21 blocks, each containing 12 bytes. The first 6 bytes of each block are for character data, leaving the other 6 for character colour. So, to fill the first block with reverse spaces, type:
FOR A=0TO5 :POKE 16128+A,160:
NEXTA
16128 is the first address for the first block, whilst 160 is the screen code for a reverse space. Now we need to add the colour. To do this, type:
FOR A=0TO5 :POKE 16134+A,82:
NEXTA
This will colour all of the reverse spaces a medium red. Having placed the sprite data into position, it will be necessary to let the system know where it is. So, to set the sprite pointer to point to our sprite, type:
POKE 15986,0

Finally, before we turn on the sprite, choose a position for it. For the X position, choose any value between 0 and 37. The Y position can be any value between 0 and 23. Addresses 15940 and 15941 are for the X and Y positions respectively, so choose values for X and Y and type:
POKE 15940, X: POKE 15941, Y

Now for the moment of truth! Clear the screen and turn on the sprite. Type:

SYS DEC('3E95')

If the above procedure has been followed correctly, then a red block will be displayed on the screen at your chosen position. If not, then turn off the sprite (SYS DEC '3E75') and try again. Please note that the system will not respond to position values outside maximum and minimum parameters.

Don't be afraid to experiment a little more with our sprite. Try altering some of the addresses in the above chart to alter sprite positions and colours or characters. Remember that **C16 SPRITE** is interupt driven, so that it will not be necessary to keep turning on the sprite, just alter the appropriate address for instant results. Also remember to turn off the system when not required (SYS DEC('3E75')), or strange things may start to happen!

If you wish to change sprite to background priority, then a 0 in address 15981 will cause the sprite to lie in front of any characters on the screen. A 255 in this address will change it to lie behind. It is possible to make the sprite lie in front of some characters and behind others. This can be very useful, and used to good effect. Here is an example of how to use this facility:
POKE 15982,26:POKE 15981,1
Now, any characters whose screen code is within the range 1 to 26, (i.e. alpha numerics), will now always appear in front of the sprite. Any others will be behind. Two rules apply here: all characters with screen codes within selected parameters will be foreground; and 127 is the maximum amount of foreground characters.

Another handy feature of this utility is collision detection. As long as our sprite rests in a clear part of the screen, address 15983 will contain a zero. If, when the sprite is moved, it happens to be in front of, or behind a character, then address 15983 will contain a 1. This makes collision detection a piece of cake!

Limitations

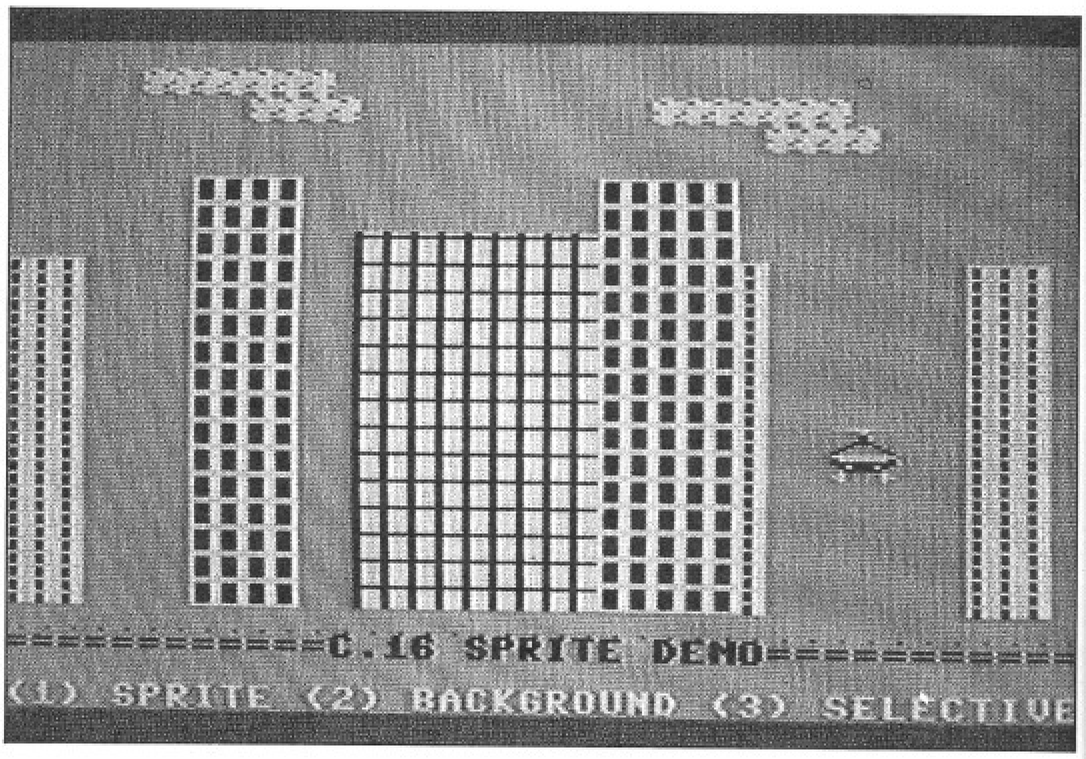
Using **C16 SPRITE** will not cause the screen to scroll, but your program may. If this happens then the sprite characters will also scroll. This is, unfortunately, a limitation of the system. Another is that the system updates the sprite only if any changes in the control addresses are detected; this is to avoid flickering. However, flickering may occur if, during animation techniques, the sprite pointer is changed rapidly when the sprite is near the bottom of the screen.

The Demonstration Program

Program 2 is the demonstration program which show **C16 SPRITE** in action. Guide the helicopter through the skyscrapers by the following keys:
Z Move left

X Move right
L Move up.
, Move down.
1 Move in front of buildings.
2 Move behind buildings
3 Move between buildings.
4 Collision mode.

Key 4 will toggle between collision mode and normal. If the sky turns grey then colliding with anything will cause a crash. Remember to have **C16 SPRITE** in memory before running the demo. Line 10 will automatically load it for you. If you are using tape, then **C16 SPRITE** must be saved immediately after the demo program as a 'boot load' file as described earlier. Also the device number '8' must be changed to a '1'.
Have fun!



PROGRAM: LISTING 1

```
0 POKE52,47:POKE56,47:CLR:CH=0
1 FORA=10TO940STEP10:READ H$
2 AD$=LEFT$(H$,4):AD=DEC(AD$):PRINTAD
3 FORB=0TO7:N$(B)=MID$(H$,(3*B+5),3):N=DEC(N$(B))
4 POKEAD+B,N:CH=CH+N:NEXTB,A
5 IFCH<>74307THENPRINT"DATA ERROR":ELSE PRINT"O.K."
6 STOP
10 DATA "3C00 A0 00 A2 28 B9 46 3E 99
20 DATA "3C08 00 0C B9 4C 3E 99 00 08
30 DATA "3C10 C8 C0 03 D0 EF B9 46 3E
40 DATA "3C18 9D 00 0C B9 4C 3E 9D 00
50 DATA "3C20 08 C8 E8 C0 06 D0 EE 60
60 DATA "3C28 AD 44 3E C9 00 10 01 60
70 DATA "3C30 C9 26 30 01 60 AD 45 3E
80 DATA "3C38 C9 00 10 01 60 C9 18 30
90 DATA "3C40 01 60 A9 01 8D 6C 3E 60
100 DATA "3C48 A0 00 8C 52 3E 8C 53 3E
110 DATA "3C50 98 CC 45 3E F0 0C 18 69
120 DATA "3C58 28 90 03 EE 53 3E C8 4C
130 DATA "3C60 51 3C A0 00 CC 44 3E F0
140 DATA "3C68 0C 18 69 01 90 03 EE 53
150 DATA "3C70 3E C8 4C 64 3C 8D 52 3E
160 DATA "3C78 18 AD 53 3E 69 0C 8D 53
170 DATA "3C80 3E AD 52 3E 8D 08 3C 8D
180 DATA "3C88 19 3C 8D 0E 3C 8D 1F 3C
190 DATA "3C90 8D F4 3C 8D FF 3C 8D 2E
200 DATA "3C98 3D 8D 39 3D 8D 0F 3D 8D
210 DATA "3CA0 1A 3D 8D 49 3D 8D 54 3D
220 DATA "3CA8 AD 53 3E 8D 09 3C 8D 1A
230 DATA "3CB0 3C 8D F5 3C 8D 00 3D 8D
240 DATA "3CB8 2F 3D 8D 3A 3D 38 E9 04
250 DATA "3CC0 8D 0F 3C 8D 20 3C 8D 10
260 DATA "3CC8 3D 8D 1B 3D 8D 4A 3D 8D
270 DATA "3CD0 55 3D 60 A0 00 B9 46 3E
280 DATA "3CD8 99 60 3E C8 C0 0C D0 F5
290 DATA "3CE0 60 A0 00 B9 60 3E 99 46
300 DATA "3CE8 3E C8 C0 0C D0 F5 60 A0
310 DATA "3CF0 00 A2 28 B9 00 0C 99 54
320 DATA "3CF8 3E C8 C0 03 D0 F5 BD 00
330 DATA "3D00 0C 99 54 3E C8 E8 C0 06
340 DATA "3D08 D0 F4 A0 00 A2 28 B9 00
350 DATA "3D10 08 99 5A 3E C8 C0 03 D0
360 DATA "3D18 F5 BD 00 08 99 5A 3E C8
370 DATA "3D20 E8 C0 06 D0 F4 60 A0 00
380 DATA "3D28 A2 28 B9 54 3E 99 00 0C
390 DATA "3D30 C8 C0 03 D0 F5 B9 54 3E
400 DATA "3D38 9D 00 0C C8 E8 C0 06 D0
410 DATA "3D40 F4 A0 00 A2 28 B9 5A 3E
420 DATA "3D48 99 00 08 C8 C0 03 D0 F5
430 DATA "3D50 B9 5A 3E 9D 00 08 C8 E8
440 DATA "3D58 C0 06 D0 F4 60 20 D3 3C
450 DATA "3D60 A2 06 A0 00 B9 54 3E C9
460 DATA "3D68 20 F0 09 99 46 3E BD 54
470 DATA "3D70 3E 9D 46 3E C8 E8 C0 06
480 DATA "3D78 D0 EA 60 20 D3 3C A2 06
490 DATA "3D80 A0 00 B9 54 3E CD 6D 3E
500 DATA "3D88 30 0E CD 6E 3E 10 09 99
510 DATA "3D90 46 3E BD 54 3E 9D 46 3E
520 DATA "3D98 C8 E8 C0 06 D0 E4 60 A9
530 DATA "3DA0 00 8D 6F 3E A0 00 B9 54
540 DATA "3DA8 3E C9 20 F0 06 A9 01 8D
550 DATA "3DB0 6F 3E 60 C8 C0 06 D0 EE
560 DATA "3DB8 60 A9 00 8D 6C 3E 20 28
570 DATA "3DC0 3C AD 6C 3E F0 1F 20 48
580 DATA "3DC8 3C 20 EF 3C 20 16 3E 20
590 DATA "3DD0 D3 3C AD 6D 3E D0 0F 20
600 DATA "3DD8 00 3C 20 9F 3D AD 47 3E
610 DATA "3DE0 F0 03 20 E1 3C 60 C9 FF
620 DATA "3DE8 D0 06 20 5D 3D 4C D7 3D
630 DATA "3DF0 20 7B 3D 4C D7 3D A9 00
640 DATA "3DF8 8D 6C 3E 20 28 3C AD 6C
650 DATA "3E00 3E F0 12 AD 6D 3E F0 07
660 DATA "3E08 C9 FF F0 03 20 E1 3C 20
670 DATA "3E10 26 3D 4C C6 3D 60 AD 72
680 DATA "3E18 3E CD 73 3E F0 25 8D 73
690 DATA "3E20 3E 18 A0 00 98 CC 72 3E
700 DATA "3E28 F0 0A C0 14 F0 15 69 0C
710 DATA "3E30 C8 4C 25 3E A8 A2 00 B9
720 DATA "3E38 00 3F 9D 46 3E C8 E8 E0
```

```
730 DATA "3E40 0C D0 F4 60 00 00 00 00
740 DATA "3E48 00 00 00 00 00 00 00 00
750 DATA "3E50 00 00 00 0C 20 20 20 20
760 DATA "3E58 20 20 10 10 10 10 10 10
770 DATA "3E60 00 00 00 00 00 00 00 00
780 DATA "3E68 00 00 00 00 01 00 5D 00
790 DATA "3E70 00 00 00 FF FF 78 A9 00
800 DATA "3E78 8D 6C 3E 20 28 3C AD 6C
810 DATA "3E80 3E F0 0E 20 26 3D A9 0E
820 DATA "3E88 8D 14 03 A9 CE 8D 15 03
830 DATA "3E90 58 60 00 00 00 78 A9 A5
840 DATA "3E98 8D 14 03 A9 3E 8D 15 03
850 DATA "3EA0 20 BE 3D 58 60 AD 44 3E
860 DATA "3EA8 CD FB 3E D0 24 AD 45 3E
870 DATA "3EB0 CD FC 3E D0 1C AD 6D 3E
880 DATA "3EB8 CD FD 3E D0 14 AD 72 3E
890 DATA "3EC0 CD 73 3E F0 09 20 16 3E
900 DATA "3EC8 20 26 3D 20 B9 3D 4C 0E
910 DATA "3ED0 CE 20 F6 3D AD 44 3E 8D
920 DATA "3ED8 FB 3E AD 45 3E 8D FC 3E
930 DATA "3EE0 AD 6D 3E 8D FD 3E 4C 0E
940 DATA "3EE8 CE 00 00 00 00 00 00 00
```

PROGRAM: DEMO

```
10 IFC=0THENC=1:LOAD"C16. SPRITE",8,1
20 POKE52,47:POKE56,47:CLR:VOL8
30 TRAP470:POKE1176,44:FORA=0TO511:POKE(12288+A),PEEK(53248+A):NEXTA
40 FORA=12800TO13055:READD:POKEA,D:NEXTA
50 FORA=0TO71:READD:POKE16128+A,D:NEXTA
60 POKE65302,1:POKE65303,33:POKE65305,65:POKE65301,93
70 POKE65287,PEEK(65287)OR16:POKE65298,PEEK(65298)AND251:POKE65299,48
80 A1$="[s +][s +][s +][s +][UP][LEFT][LEFT][LEFT][LEFT]":FORA=0TO15:B$(1)=B$(1)+A1$:NEXT
90 A1$="[c -][c -][c -][c -][UP][LEFT][LEFT][LEFT][LEFT]":FORA=0TO13:B$(2)=B$(2)+A1$:NEXT
100 A1$="[s -][s -][s -][UP][LEFT][LEFT][LEFT]":FORA=0TO12:B$(3)=B$(3)+A1$:NEXT
110 A1$="[255][255][255][UP][LEFT][LEFT][LEFT]":FORA=0TO11:B$(4)=B$(4)+A1$:NEXT
120 B$(5)="[c *][c *][c *][c *][c *][c *][c *][DOWN][LEFT][LEFT][LEFT][c *][c *][c *][c *]":POKE1339,121:PRINTCHR$(147)
130 FORA=1TO4:R=INT(RND(1)*36):CHAR,R,20,B$(4):NEXTA
140 FORA=1TO4:R=INT(RND(1)*36):CHAR,R,20,B$(3):NEXTA
150 FORA=1TO3:R=INT(RND(1)*35):CHAR,R,20,B$(2):NEXTA
160 FORA=1TO3:R=INT(RND(1)*35):CHAR,R,20,B$(1):NEXTA
170 CHAR,5,1,B$(5):CHAR,24,2,B$(5)
180 CHAR,0,21,"[GREEN][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B][c B]"
190 CHAR,0,22,"[BLACK]------------C.16 SPRITE DEMO-------------"
200 CHAR,0,24,"[WHITE](1) SPRITE (2) BACKGROUND (3) SELECTIVE[HOME]"
210 X=0:Y=0:GOSUB380:SYSDEC("3E95"):S1=0:S2=1:CO=0:CR=0
220 GETA$
230 CO=CO+1:IFCO=3THENCO=0:S1=S1+1:IFS1>S2THENS1=S1-2
240 IFA$="Z"THENX=X-1:GOSUB340:GOSUB380
250 IFA$="X"THENX=X+1:GOSUB360:GOSUB380
260 IFA$="L"THENY=Y-1:GOSUB380
270 IFA$=","THENY=Y+1:GOSUB380
280 IFA$="1"THENPOKE15981,0
290 IFA$="2"THENPOKE15981,255
300 IFA$="3"THENPOKE15981,91
310 IFA$="4"THENCR=CR+1:IFCR>1THENCR=0:POKE65301,93
320 IFCR=1THENPOKE65301,65:GOTO430
330 POKE15986,S1:GOTO220
340 IFPEEK(15986)=4ORPEEK(15986)=5THENX=X+1:S1=2:S2=3:RETURN
350 S1=0:S2=1:RETURN
360 IFPEEK(15986)=0ORPEEK(15986)=1THENX=X-1:S1=2:S2=3:RETURN
370 S1=4:S2=5:RETURN
380 IFX<0THENX=0
390 IFX>37THENX=37
400 IFY<0THENY=0
410 IFY>19THENY=19
420 POKE15940,X:POKE15941,Y:RETURN
430 IFPEEK(15983)=0THEN330
440 FORA=1TO16:COLOR0,A:SOUND3,10*A,2:NEXTA
450 A$=CHR$(32):PRINT"[BLACK]":COLOR0,7,5
460 SYSDEC("3E75"):FORQ=1TO1000:NEXTQ:GOTO120
470 POKE65287,PEEK(65287)AND239:POKE65298,PEEK(65298)OR4:POKE65299,208:STOP
480 DATA 255,0,0,0,2,8,32,128,255,192,128,128,160,168,170,175
490 DATA 192,0,0,0,15,63,254,250,255,191,106,26,5,13,63,12
500 DATA 255,255,170,170,85,1,3,0,232,160,128,64,64,192,240,192
510 DATA 63,0,0,0,0,2,8,32,255,48,32,32,168,2,0,0
520 DATA 240,0,0,0,0,0,128,32,63,47,26,7,1,12,60,12
530 DATA 255,255,170,87,85,0,0,0,240,224,144,64,0,192,240,192
540 DATA 3,0,0,0,240,252,191,175,255,3,2,2,10,42,170,250
550 DATA 255,0,0,0,128,32,8,2,43,10,2,1,1,3,15,3
560 DATA 255,255,170,170,85,64,192,0,255,254,169,164,80,112,252,48
570 DATA 3,0,0,0,2,8,32,128,240,192,128,128,160,168,170,175
580 DATA 0,0,0,0,15,63,254,250,3,0,0,0,0,2,8,32
590 DATA 252,48,32,32,168,2,0,0,0,0,0,0,0,0,128,32
600 DATA 0,0,0,0,240,252,191,175,15,3,2,2,10,42,170,250
610 DATA 192,0,0,0,128,32,8,2,255,215,215,215,215,215,215,255
620 DATA 191,170,191,191,191,191,191,191,255,223,223,223,255,223,223,223
630 DATA 238,238,238,170,238,238,238,170,60,207,255,255,63,252,255,60
640 DATA 64,65,66,67,68,69,121,121,121,121,121,121
650 DATA 82,83,84,67,68,69,121,121,121,121,121,121
660 DATA 70,71,72,73,74,75,121,121,121,121,121,121
670 DATA 85,86,87,73,74,75,121,121,121,121,121,121
680 DATA 76,77,78,79,80,81,121,121,121,121,121,121
690 DATA 88,89,90,79,80,81,121,121,121,121,121,121
```

RS232 On The Plus/4

19,200 baud on the Plus/4? A Beeb listing in a Commodore mag? Are we kidding you? We certainly aren't. . .

By R C Hemes

Surprising though it may seem, the Plus/4 is a lot faster at communicating using RS232 than the 64. This is due to the 64 using a software simulation to copy the action of the 6551 ACIA IC which would normally be used for RS232. Indeed, the 64 is so slow that it often misses characters even at the leisurely 300 baud.

The Plus/4 on the other hand, has a 6551 which handled all the RS232 signals except CTS which is dealt with by a 6529. Also, there is no need to connect S-into pin B (as suggested in 'Interfacing with the RS232', *Your Commodore,* January 1987, p 82-90).

The Plus/4 software has the ability to use XON/XOFF flow control with the user's choice of XON/XOFF characters. These are normally CTL/S for XOFF and CTL/Q for XON. This facility is used to stop the remote device from transmitting more data when the receiving device has no more room in its input buffer, and to restart the remote device when the receiving device has removed enough characters from its buffer.

The Plus/4 has a dedicated 64-byte RS232 user receive buffer located at $03F7, to $0436, and a one byte system transmit buffer at $S07CF which is used to hold the current XON/OFF character.

If the ACIA is configured, the interrupt handler will call two subroutines to handle RS232 interrupts. The first routine:

```
  5 REM BBC PROGRAM TO TEST PLUS/4 TO BBC RS232 AT 19200 BAUD
 10 *FX7,8
 20 *FX8,8
 30 *FX3,5
 40 *FX2,1
 50 FOR Y=0TO7
 60 A$=INKEY$(0)
 70 IF A$<>CHR$(19) THEN100
 80 A$=INKEY$(0)
 90 IF A$<>CHR$(17) THEN80
100 PRINT STR$(Y);
110 NEXTY
120 GOTO 50

  5 REM PLUS/4 PROGRAM TO TEST PLUS/4 TO BBC RS232 AT 19200 BAUD
 10 OPEN2,2,0,CHR$(31)+CHR$(5)
 20 POKEDEC("FC"),17:POKEDEC("FD"),19
 30 GET£2,A$
 40 IFA$<>"" THENPRINTA$;
 50 GOTO 20
```

Listings 1 and 2: programs for the BBC B (top) and the Plus/4 to show transmission from the BBC to the Plus/4 at 19,200 baud.

Checks for a remote device initiated XON/XOFF sequence and handles it appropriately;
Checks user receive buffer is full, and if so then ignores this received character and returns;
If there is room for eight characters, then it sets various flags, and stores XOFF character from $FD into the system transmit buffer and puts the received character in the user input buffer.

The second routine called will:
Check ACIA transmit buffer empty and return if not;
Check for CTS signal low, and return if so;
Check input buffer full flag, and send either XOFF or XON as appropriate.

It is the job of the RS232 portion of the CHRIN routine to reset the user buffer-full and remote-paused flags and initiate sending of the XON character.

Note that the XON/XOFF protocol is used only if the user has POKEd the XON/XOFF characters into $FC and $FD respectively; if these two locations are zero then characters received when the buffer is full are ignored.

And The Proof. . .

I have tested the Plus/4 connected to a BBC Model B, running at 19,200 baud, with the BBC sending the Plus/4 at full speed, and over a one hour period not a single character was lost by the Plus/4. The two programs for the Plus/4 and the BBC are shown in Listing 1 and 2.

Unfortunately, there is a bug in the Plus/4 ROM RS232 routines, which causes the Plus/4 to crash immediately after it has transmitted the first XON resume character, and the rest of this article describes how to fix this bug.

First we need to make our own copy of the Kernal ROM, and then patch the incorrect code. This is not so easy. . . Listing 3 is a listing of a Basic Program and a machine code program which copy the ROM down into RAM, cause the new version of the Kernal to be executed, and inhibit switching back to ROM. The top of memory pointers are also reset to $7FFF, and the bad code in the RAM copy is fixed. The Basic program must be typed in **Exactly** as shown, with **No** additional spaces, etc, as the machine code program is immediately above it at $4163.

A disassembly of the RS232 code in the Kernal is included in figure 3.

```
1 POKE51,0:POKE53,0:POKE55,0:POKE52,128:POKE54,128:POKE56,128:CLR

2 SYS4163

3 NEW
```

Listing 3A: Basic program to reset top of memory pointers and call machine code program to copy the Kernal and Basic from ROM to RAM, and change all references to $FF3E to $FF3F.

Listing 3B: Machine code program to copy ROM to RAM and inhibit switching to ROM.

```
                         ORG   $1043
1043 78                  SEI
1044 8D 3E FF            STA   $FF3E      ;SWITCH TO ROM
1047 A0 00               LDY   £$00
1049 B9 00 80    LP1     LDA   $8000,Y    ;COPY PART 1 OF ROM TO RAM
104C 99 00 80            STA   $8000,Y    ;$8000 TO $FCFF
104F C8                  INY
1050 D0 F7               BNE   LP1

1052 EE 4B 10            INC   LP1+2

1055 EE 4E 10            INC   LP1+5

1058 AD 4E 10            LDA   LP1+5

105B C9 FD               CMP   £$FD

105D D0 EA               BNE   LP1

105F A0 40               LDY   £$40

1061 B9 00 FF    LP2     LDA   $FF00,Y    ;COPY PART 2 OF ROM TO RAM

1064 99 00 FF            STA   $FF00,Y    ;$FF40 TO $FFFF

1067 C8                  INY

1068 D0 F7               BNE   LP2
```

```
106A A9 3F          LDA   £<$FF3F   ;INHIBIT ALL ROM SWITCHING
106C 8D 82 04       STA   $0482
106F 8D 9E 04       STA   $049E
1072 8D AC 04       STA   $04AC
1075 8D B7 04       STA   $04B7
1078 8D C2 04       STA   $04C2
107B 8D CD 04       STA   $04CD
107E 8D D8 04       STA   $04D8
1081 8D E3 04       STA   $04E3
1084 8D E1 07       STA   $07E1
1087 8D 32 81       STA   $8132
108A 8D 4E 81       STA   $814E
108D 8D BB CF       STA   $CFBB
1090 8D F7 FF       STA   $FFF7
1093 8D 3F FF       STA   $FF3F     ;SWITCH TO RAM
1096 A9 4C          LDA   £$4C      ;PUT JMP $CEC5 AT $EB1B
1098 8D 1B EB       STA   $EB1B
109B A9 C5          LDA   £<$CEC5
109D 8D 1C EB       STA   $EB1B+1
10A0 A9 CE          LDA   £>$CEC5
10A2 8D 1D EB       STA   $EB1B+2
10A5 A2 06          LDX   £$06      ;COPY CODE TO PATCH AREA
10A7 BD B2 10  LP3  LDA   PCH,X
10AA 9D C5 CE       STA   $CEC5,X
10AD CA             DEX
10AE 10 F7          BPL   LP3
10B0 58             CLI
10B1 60             RTS
10B2 8D CF 07  PCH  STA   $07CF     ;SAVE CH IN SYSTEM O/P BUFFER
10B5 68             PLA             ;PULL NEXT USER INPUT CHAR
10B6 4C 1E EB       JMP   $EB1E     ;RETURN TO RS232 RCUTINE
```

Listing 4: The Plus/4 RS232 routines.

```
        TRANSMIT RS232 CHARACTER, ENTERED FROM IRQ ROUTINE AT $CE28
EA5B AD D4 07 SEA5B     LDA $07D4        ;GET ACIA STATUS
EA5E 29 10              AND £$10         ;TX DATA REG FLAG
EA60 F0 32              BEQ BEA94        ;->TX DATA REG NOT EMPTY
EA62 AD 10 FD           LDA $FD10        ;6529B
EA65 29 02              AND £$02         ;CTS PRESENT
EA67 F0 2B              BEQ BEA94        ;->NO, DO NOT TRANSMIT
EA69 A2 00              LDX £$00
EA6B 2C D0 07           BIT $07D0        ;SYSTEM INPUT BUFFER FULL?
EA6E 10 09              BPL BEA79        ; -> NO
EA70 AD CF 07           LDA $07CF        ;YES, GET CHAR FROM SYS BUF
EA73 8E D0 07           STX $07D0        ;CLEAR SYSTEM BUFFER FULL FLG
EA76 4C 89 EA           JMP JEA89
EA79 2C CE 07 BEA79     BIT $07CE        ;USR INPUT BUFFER FULL?
EA7C 10 16              BPL BEA94        ; -> NO
EA7E 2C D6 07           BIT $07D6        ;YES, LOCAL PAUSE SET?
EA81 30 11              BMI BEA94        ; -> YES
EA83 AD CD 07           LDA $07CD        ;NO,GET USER CHAR TO SEND
EA86 8E CE 07           STX $07CE        ;CLEAR USER BUFFER FULL FLAG
EA89 8D 00 FD JEA89     STA $FD00        ;ACIA TRANSMIT REG
EA8C AD D4 07           LDA $07D4        ;GET ACIA STATUS REG
EA8F 29 EF              AND £$EF         ;SAVE ONLY TRANSMIT DATA REG
EA91 8D D4 07           STA $07D4        ; STATUS BIT
EA94 60        BEA94    RTS
        CHECK FOR RECEIVED RS232 CHARACTER ENTERED FROM IRQ AT $CE25
EA95 AD D4 07 SEA95     LDA $07D4        ;GET ACIA STATUS REG
EA98 29 08              AND £$C8         ;RECEIVE DATA REG FLAG
EA9A F0 54              BEQ BEAF0        ;->RX DATA REG NOT FULL
EA9C AD D4 07           LDA $07D4        ;GET RX DATA REG FLAG
EA9F 29 F7              AND £$F7         ;SAVE ONLY RX DATA REG
```

```
EAA1 8D D4 07              STA $07D4        ; STATUS BIT
EAA4 AD 00 FD              LDA $FD00        ;GET ACIA RCV REGISTER
EAA7 F0 19                 BEQ BEAC2        ; -> NO DATA OR NULL
EAA9 8D D5 07              STA $07D5        ;SAVE THE CHAR
EAAC C5 FC                 CMP $FC          ;IS IT XON CHARACTER?
EAAE D0 07                 BNE BEAB7        ; -> NO
     RECEIVED XON REMOTE END WANTS US TO RESTART TRANSMISSION
EAB0 A9 00                 LDA £$00         ;YES, CLEAR
EAB2 8D D6 07              STA $07D6        ;  LOCAL PAUSE FLAG
EAB5 F0 39                 BEQ BEAF0        ;   AND RETURN
EAB7 C5 FD      BEAB7      CMP $FD          ;IS IT XOFF CHARACTER?
EAB9 D0 07                 BNE BEAC2        ; -> NO
     RECEIVED XOFF CHARACTER, REMOTE END WANTS US TO STOP TRANSMISSION
EABB A9 FF                 LDA £$FF         ;YES, SET LOCAL
EABD 8D D6 07              STA $07D6        ;  PAUSE FLAG
EAC0 D0 2E                 BNE BEAF0        ;   AND RETURN
EAC2 AD D3 07 BEAC2        LDA $07D3        ;NCHARS IN USR INPUT BUFFER
EAC5 C9 3F                 CMP £$3F         ;FULL?
EAC7 F0 27                 BEQ BEAF0        ; -> YES
EAC9 C9 38                 CMP £$38         ;NO, AT THRESHOLD FOR XOFF?
EACB D0 0F                 BNE BEADC        ; -> NO
EACD A5 FD                 LDA $FD          ;YES, GET XOFF CHAR
EACF F0 0B                 BEQ BEADC        ; -> NO XOFF CHAR DEFINED
EAD1 8D CF 07              STA $07CF        ;PUT IN SYSTEM O/P BUFFER
EAD4 A9 FF                 LDA £$FF
EAD6 8D D0 07              STA $07D0        ;SET SYSTEM BUFFER FULL FLG
EAD9 8D D7 07              STA $07D7        ;SET REMOTE PAUSE FLAG
EADC AE D1 07 BEADC        LDX $07D1        ;GET USER I/P BUFFER INDEX
EADF E8                    INX              ;ADD ONE
EAE0 8A                    TXA
EAE1 29 3F                 AND £$3F         ;MAKE INDEX MOD 64 AND
```

```
EAE3 8D D1 07            STA $07D1       ; STORE NEW INDEX
EAE6 AA                  TAX             ;GET INDEX IN .X
EAE7 AD D5 07            LDA $07D5       ;GET RECEIVED CHAR
EAEA 9D F7 03            STA $03F7,X     ; AND STORE IN USER I/P BUF
EAED EE D3 07            INC $07D3       ;NCHARS IN USR I/P BUFFER
EAF0 60          BEAF0   RTS
     CONTINUATION OF CHRIN FOR RS232 DEVICE
EAF1 AD D3 07 SEAF1      LDA $07D3       ;NCHARS IN USR I/P BUFFER
EAF4 F0 34               BEQ BEB2A       ; -> EMPTY
EAF6 08                  PHP             ;SAVE INHIBIT STATUS
EAF7 78                  SEI
EAF8 AE D2 07            LDX $07D2       ;I/P Q FETCH INDEX
EAFB E8                  INX             ;ADD ONE
EAFC 8A                  TXA
EAFD 29 3F               AND £$3F        ;MAKE MOD 64
EAFF 8D D2 07            STA $07D2       ; AND RESTORE IT
EB02 28                  PLP             ;RECOVER INHIBIT BIT
EB03 AA                  TAX             ;I/P Q FETCH INDEX
EB04 BD F7 03            LDA $03F7,X     ;GET NEXT CHAR FROM I/P BUF
EB07 48                  PHA             ; ONTO STACK
EB08 CE D3 07            DEC $07D3       ;DECREMENT NCHARS IN BUF
EB0B AD D3 07            LDA $07D3       ;GET NCHARS IN I/P BUF
EB0E C9 08               CMP £$08
EB10 D0 19               BNE BEB2B       ; -> NCHARS <> 8
EB12 2C D7 07            BIT $07D7       ;IS REMOTE PAUSE FLAG SET?
EB15 10 14               BPL BEE2B       ; -> NO
EB17 A5 FC               LDA $FC         ;IS XON CHAR DEFINED?
EB19 F0 10               BEQ BEB2B       ; -> NO
EB1B 8D CF 07            STA $07CF       ;YES, PUT IT IN SYS O/F BUF
    HERE IS THE BUG. THE NEXT CHARACTER TO BE RETURNED TO THE USER
    IS THE TOP ENTRY ON THE STACK. A PLA SHOLD BE DONE HERE.
```

```
EB1E 38                  SEC
EB1F 6E D0 07            ROR $07D0          ;RESET SYS BUFFER FULL FLAG
EB22 4E D7 07            LSR $07D7          ; AND REMOTE PAUSE FLAG
EB25 2C D8 07 SEB25      BIT $07D8          ;ACIA PRESENT?
EB28 10 0B               BPL BEB35          ; -> NO
EB2A 48       BEB2A      PHA                ;YES, SAVE NEXT CHAR TO SEND
EB2B AD D4 07 BEB2B      LDA $07D4          ;GET ACIA STATUS REG
EB2E 29 4F               AND £%C1001111     ; SAVE DSR
EB30 49 40               EOR £%01000000     ;  AND INVERT IT
EB32 85 90               STA $90            ;   STORE IN KERNAL ST WORD
EB34 68                  PLA                ;RECOVER CHAR READ
EB35 18       BEB35      CLC                ;FLAG NO ERROR
EB36 60                  RTS
     SETUP USER CHARACTER TO TRANSMIT
EB37 2C CE 07 BEB37      BIT $07CE          ;USER XMIT BUFFER FULL?
EB3A 30 FB               BMI BEB37          ;->YES, WAIT FOR IT TO EMPTY
EB3C 8D CD 07            STA $07CD          ;NO, STORE USER O/P CHARACTER
EB3F 38                  SEC                ; IN USER XMIT BUFFER, SET
EB40 6E CE 07            ROR $07CE          ;  USER XMIT BUFFER FULL FLAG
EB43 4C 2A EB            JMP BEB2A
     INITIALIZE RS232 CONSTANTS AND ACIA
EB46 A9 00    SEB46      LDA £$00           ;CLEAR ALL
EB48 A2 0B               LDX £$0B           ; RS232
EB4A 9D CD 07 BEB4A      STA $07CD,X        ;  VARIABLES
EB4D CA                  DEX
EB4E 10 FA               BPL BEB4A
EB50 8D 01 FD            STA $FD01          ;RESET ACIA
EB53 85 FC               STA $FC            ;CLEAR XON CHARACTER
EB55 85 FD               STA $FD            ;CLEAR XOFF CHARACTER
EB57 60                  RTS
```

Windows

Put text anywhere on the screen you want, and scroll it too, with this set of fast C64 routines.

By R.A. Henderson

Have you ever tried drawing windows with your 64, and then writing text to those windows in an attempt to emulate the features of the ubiquitous IBM PC? It is not a difficult task in Basic using the graphics symbols available in the Commodore character set. However, it is of limited use in this simple form, and is very cumbersome to manipulate.

The routines which are presented in this article are all machine code based. They enable complex windowing tasks to be implemented easily, and provide many useful features.

With these routines you can draw a window of any size, anywhere on the screen. On removing that window, the text underneath is restored. Up to five windows can be displayed at any one time, and in all cases the text underneath is restored as each window is removed. The windows can even overlap one another. The only restriction imposed when using multiple windows, is that they must be removed in reverse order to their application.

Finally, routines are presented which allow the contents of the windows to be scrolled in any one of four directions: up, down, left and right. Indeed, multiple scrolling of different windows in different directions is possible, although this feature cannot be applied to overlapping windows.

Now, down to the routines. All the code has been written and assembled using the Supersoft Micro Assembler, but is pretty well universal. The code has been assembled starting at $C110 so that it does not interfere with your Basic program. The program is constructed from a number of modules, and the line numbers presented with each module, whilst essentially arbitrary, do enable you to slot the modules together easily.

Listing 1 - Variables

The first routine declares all the variables used by the program. It also identifies, in line 300, the start point for the assembly process at $C110.

A word or two about the major variables will ease understanding of the program.

Each window is defined by four parameters: the top left-hand corner of the window frame; the number of columns and rows of text within the window; and the colour of the window frame.

The corner is identified by its memory location. This can be established by referring to the screen memory map in Appendix G of the User Manual. The top left-hand corner of the screen is 1024 ($0400), and the bottom right 2023 ($07E7). The corner must be identified as two bytes, LOCORNER and HICORNER, in normal low-high format.

The other three parameters, COLUMN, ROW and COLOUR, can all be specified as single byte numbers, and in the case of COLOUR, this is defined in Appendix G of the User Manual.

FRAME represents the parameters which make up the window frame. By referring to Appendix E of the User Manual, you will see that 73 is the top right-hand corner of the frame, 66 is a vertical line, 75 the bottom right-hand corner, 67 a horizontal line, 32 a space, 85 the top-left corner and 74 the bottom left-hand corner. These parameters can be changed, if desired, to give alternative window outlines.

In order to restore the contents of the screen once a window is removed, it is first necessary to save those contents. To avoid wasting valuable memory space, I have chosen to store the contents of the screen under each window in that area of RAM which resides beneath the Basic ROM. MEMSTRT identifies the start of each stored window in memory, using two bytes in low-high format, and starts at $A000. PNTR points to the start of the most recent window. MEMCORN stores the corner location in two bytes, and MEMPARAM uses two bytes to store COLUMN and ROW respectively.

A word of warning! There are no traps in the program to prevent you from specifying unreliable windows. Poor specification can result in windows which wrap around the screen, or, worse, if you specify a window whose size would cause it to go beyond memory location $07E7, then you are in grave danger of overwriting your Basic program, starting at $0800.

Listing 2 - Drawing a Window

Having declared our variables in Listing 1, this is the first routine which

actually does something.

To prove that this routine works, assemble it, together with the variables (Listing 1) and make the following POKES (in immediate mode):

POKE49427,166:POKE49428,4:
POKE49429,10:POKE49430,15:
POKE49431,5.

Now call SYS49473 and you should see a green window frame appear instantly on your screen.

Listing 3 - Save and Replace Window

Before drawing a window, it is first necessary to save the screen contents under that window. Then, when you remove that window, the original screen contents can be replaced.

Now assemble Listing 3 together with Listings 1 and 2, and then repeat the series of POKES. Call SYS 49582 followed by SYS 49473 and the green window will appear. Now call SYS 49714. The window is removed, and the original screen contents replaced.

Listings 4 and 5 - Scrolling

The routines in Listings 4 and 5 provide up, down, right, and left scrolling of the windows. If you don't want this facility, then omit these routines entirely.

We won't bother testing these routines until you've entered our final two listings, since this next listing avoids the need for all those POKES.

Listing 6 - Data Entry

We can simplify the process of entering our window data by making use of functions already in your 64. The ones we will use are:

1. At $E206 in the kernal ROM, which fetches the current character.
2. At $E20E also in the kernal, which checks for, and skips the "," character.
3. At $A96B in the Basic ROM, which places the entered data into locations $14 and $15 of Zero Page.

Listing 6 accomplishes this by loading our window parameters, LOCORNER, HICORNER, COLUMN, ROW and COLOUR, into the variables table of Listing 1.

Listing7 - Module Linker

I have presented you with a number of routines which can be strung together to provide a comprehensive windowing program. This last listing is self-explanatory, and simplifies the task of accessing the various functions from Basic. If you have decided to omit the scrolling routines, then delete line 590 to 910 also.

If you have entered all the code and assembled it, then you should get a start address for assembly of $C110, and a finish address of $C40B.

Now down to using the program. The machine code can be accessed either from Basic or in immediate mode as follows:-

Draw window: SYS 49473,CR,CM,RW,CL
Scroll up: SYS 49487,CR,CM,RW,CL
Scroll down: SYS 49494,CR,CM,RW,CL
Scroll right: SYS 49501,CR,CM,RW,CL
Scroll left: SYS 49508,CR,CM,RW,CL
Remove window: SYS 49483
where:

CR = corner location
CM = number of columns
RW = number of rows
and CL = colour

The best way to use the program is by experimentation, and our final listing is a short Basic program to demonstrate this.

PROGRAM: 1.LISTING

```
100 ! ********************************************
110 ! **                                        **
120 ! **              **********                **
130 ! **              * WINDOW *                **
140 ! **              **********                **
150 ! **        VERSION V4   18/01/87           **
160 ! **                                        **
170 ! ********************************************
180 !
190 LOCORNER=STORE
200 HICORNER=STORE+1
210 COLUMN=STORE+2
220 ROW=STORE+3
230 COLOUR=STORE+4
240 Z0=$FB
250 Z1=$FC
260 Z2=$FD
270 Z3=$FE
280 TEMP1=$FF
290 !
300 *=$C110
310 !
320 TEMP2 BYT 0
330 TEMP3 BYT 0
340 PNTR BYT 0
350 STORE BYT 0,0,0,0,0
360 MEMSTRT BYT $00,$A0,0,0,0,0,0,0,0,0,0,0
370 MEMCORN BYT 0,0,0,0,0,0,0,0,0,0
380 MEMPARAM BYT 0,0,0,0,0,0,0,0,0,0
390 !
400 ! ************ WINDOW OUTLINE ***********
410 FRAME BYT 73,66,75,67,32,67,85,66,74
420 ! ***************************************
430 !
```

PROGRAM: 2.LISTING

```
1120 ! ** DRAW WINDOW **
1130 WINDOW LDY COLUMN
1140 INY
1150 LDX #0
1160 JSR DRAW
1170 INX
1180 LOOP1 JSR DRAW
1190 BEQ SKIP1
1200 DEX
1210 DEX
1220 JMP LOOP1
1230 SKIP1 INX
1240 JSR DRAW
1250 RTS
1260 !
1270 DRAW JSR SETUP
1280 JSR SCREEN
1290 INX
1300 LDA #0
1310 STA TEMP1
1320 LOOP2 JSR ADD1
1330 JSR SCREEN
1340 INC TEMP1
1350 LDA TEMP1
1360 CMP ROW
1370 BCC LOOP2
1380 INX
1390 JSR ADD1
1400 JSR SCREEN
1410 DEY
1420 RTS
1430 !
1440 SCREEN JSR ADD2
1450 LDA FRAME,X
1460 STA (20),Y
1470 LDA COLOUR
1480 STA (22),Y
1490 RTS
1500 !
1510 !
1520 ! ** ADD LINE **
1530 ADD1 CLC
1540 LDA 20
1550 ADC #$28
1560 STA 20
1570 BCC SKIP2
1580 INC 21
1590 SKIP2 RTS
1600 !
1610 !
1620 ! ** ADD COLOUR MEMORY **
1630 ADD2 CLC
1640 LDA 20
1650 STA 22
1660 LDA 21
1670 ADC #$D4
1680 STA 23
1690 RTS
1700 !
1710 !
1720 SETUP LDA LOCORNER
1730 STA 20
1740 LDA HICORNER
1750 STA 21
1760 RTS
1770 !
1780 !
```

PROGRAM 3.LISTING

```
1790 ! ** SAVE WINDOW **
1800 SAVWIN LDX PNTR
1810 CPX #10
1820 BEQ SKIP3
1830 LDA MEMSTRT,X
1840 STA 22
1850 LDA LOCORNER
1860 STA 20
1870 STA MEMCORN,X
1880 STA TEMP2
1890 LDA COLUMN
1900 STA MEMPARAM,X
1910 INX
1920 LDA MEMSTRT,X
1930 STA 23
1940 LDA HICORNER
1950 STA 21
1960 STA MEMCORN,X
1970 STA TEMP3
1980 LDA ROW
1990 STA MEMPARAM,X
2000 INX
2010 TXA
2020 STA PNTR
2030 JSR SAVE
2040 JSR SWITCH
2050 JSR SAVE
2060 LDX PNTR
2070 LDA 22
2080 STA MEMSTRT,X
2090 INX
2100 LDA 23
2110 STA MEMSTRT,X
2120 SKIP3 RTS
2130 !
2140 !
2150 SAVE INC ROW
2160 INC ROW
2170 INC COLUMN
2180 INC COLUMN
2190 LDX #0
2200 LOOP3 LDY #0
2210 LOOP4 LDA (20),Y
2220 STA (22),Y
2230 INY
2240 CPY COLUMN
2250 BCC LOOP4
2260 JSR ADD1
2270 JSR ADD3
2280 INX
2290 CPX ROW
2300 BCC LOOP3
2310 DEC COLUMN
2320 DEC COLUMN
2330 DEC ROW
2340 DEC ROW
2350 RTS
2360 !
2370 !
2380 ! ** REPLACE WINDOW **
2390 REPWIN LDA $01
2400 AND #%11111110
2410 STA $01
2420 LDX PNTR
2430 BEQ SKIP4
2440 DEX
2450 LDA MEMSTRT,X
2460 STA 23
2470 LDA MEMCORN,X
2480 STA 21
2490 STA TEMP3
2500 LDA MEMPARAM,X
2510 STA ROW
2520 DEX
2530 LDA MEMSTRT,X
2540 STA 22
2550 LDA MEMCORN,X
2560 STA 20
2570 STA TEMP2
2580 LDA MEMPARAM,X
2590 STA COLUMN
2600 TXA
2610 STA PNTR
2620 JSR REPLACE
2630 JSR SWITCH
2640 JSR REPLACE
2650 SKIP4 LDA $01
2660 ORA #%00000001
2670 STA $01
2680 RTS
2690 !
2700 !
2710 REPLACE INC ROW
2720 INC ROW
2730 INC COLUMN
2740 INC COLUMN
2750 LDX #0
2760 LOOP5 LDY #0
2770 LOOP6 LDA (22),Y
2780 STA (20),Y
2790 INY
2800 CPY COLUMN
2810 BCC LOOP6
2820 JSR ADD1
2830 JSR ADD3
2840 INX
2850 CPX ROW
2860 BCC LOOP5
2870 DEC COLUMN
2880 DEC COLUMN
2890 DEC ROW
2900 DEC ROW
2910 RTS
2920 !
2930 !
2940 ADD3 CLC
2950 LDA 22
2960 ADC COLUMN
2970 STA 22
2980 BCC SKIP5
2990 INC 23
3000 SKIP5 RTS
3010 !
3020 !
3030 SWITCH LDA 22
3040 PHA
3050 LDA 23
3060 PHA
3070 LDA TEMP2
3080 STA 20
3090 LDA TEMP3
3100 STA 21
3110 JSR ADD2
3120 STA 21
3130 PLA
3140 STA 23
3150 PLA
3160 STA 22
3170 RTS
3180 !
3190 !
```

PROGRAM: 4.LISTING

```
3200 ! ** SCROLL UP **
3210 UPSCROLL LDA #0
3220 STA TEMP1
3230 JSR SETUP
3240 JSR ADD1
3250 JSR SUBSCROLL1
3260 LDA #32
3270 JSR SUBSCROLL2
3280 !
3290 JSR SETUP
3300 JSR ADD1
3310 JMP SKIP6
3320 !
3330 !
3340 ! ** SCROLL DOWN **
3350 DOWNSCROLL LDA #$FF
3360 STA TEMP1
3370 JSR DOWNSUB
3380 JSR SUBSCROLL1
3390 LDA #32
3400 JSR SUBSCROLL2
3410 !
3420 JSR DOWNSUB
3430 SKIP6 JSR ADD2
3440 STA 21
3450 JSR SUBSCROLL1
3460 RTS
3470 !
3480 !
4030 SUBSCROLL1 LDX ROW
4040 DEX
4050 LOOP7 LDY COLUMN
4060 LDA 20
4070 STA 22
4080 LDA 21
4090 STA 23
4100 LDA TEMP1
4110 BEQ ADD
4120 BNE SUB
4130 ADD JSR ADD1
4140 JMP LOOP8
4150 SUB JSR SUB1
4160 LOOP8 LDA (20),Y
4170 STA (22),Y
4180 DEY
4190 BNE LOOP8
4200 DEX
4210 BNE LOOP7
4220 RTS
4230 !
4240 !
4250 SUBSCROLL2 LDY COLUMN
4260 LOOP9 STA (20),Y
4270 DEY
4280 BNE LOOP9
4290 RTS
4300 !
4310 !
4320 DOWNSUB JSR SETUP
4330 JSR ADD1
4340 LDX ROW
4350 DEX
4360 LOOP10 JSR ADD1
4370 DEX
4380 BNE LOOP10
4390 RTS
4400 !
4410 !
4420 ! ** SUBTRACT LINE **
4430 SUB1 SEC
4440 LDA 20
4450 SBC #$28
4460 STA 20
4470 BCS SKIP7
4480 DEC 21
4490 SKIP7 RTS
4500 !
4510 !
```

PROGRAM: 5.LISTING

```
4520 ! ** SCROLL RIGHT **
4530 RTSCROLL LDX ROW
4540 JSR SETUP
4550 JSR ADD1
4560 LOOP11 JSR ADD2
4570 LDY COLUMN
4580 DEY
4590 LOOP12 LDA (20),Y
4600 INY
4610 STA (20),Y
4620 DEY
4630 LDA (22),Y
4640 INY
4650 STA (22),Y
4660 DEY
4670 DEY
4680 BNE LOOP12
4690 INY
4700 LDA #32
4710 STA (20),Y
4720 JSR ADD1
4730 DEX
4740 BNE LOOP11
4750 RTS
4760 !
4770 !
4780 ! ** SCROLL LEFT **
4790 LFTSCROLL LDX ROW
4800 JSR SETUP
4810 JSR ADD1
4820 INC COLUMN
4830 LOOP13 JSR ADD2
4840 LDY #2
4850 LOOP14 LDA (20),Y
4860 DEY
4870 STA (20),Y
4880 INY
4890 LDA (22),Y
4900 DEY
4910 STA (22),Y
4920 INY
4930 INY
4940 CPY COLUMN
4950 BNE LOOP14
4960 DEY
4970 LDA #32
4980 STA (20),Y
4990 JSR ADD1
5000 DEX
5010 BNE LOOP13
5020 DEC COLUMN
5030 RTS
5040 !
5050 !
```

PROGRAM: 6.LISTING

```
920 ! ** FETCH WINDOW PARAMETERS**
930 PARAMETERS JSR FETCH
940 STY LOCORNER
950 STA HICORNER
960 JSR FETCH
970 STY COLUMN
980 JSR FETCH
990 STY ROW
1000 JSR FETCH
1010 STY COLOUR
1020 RTS
1030 !
1040 FETCH JSR $E206
1050 JSR $E20E
1060 JSR $A96B
1070 LDA $15
1080 LDY $14
1090 RTS
1100 !
1110 !
```

PROGRAM: 7.LISTING

```
440 ! ************************
450 ! **     SET UP WINDOW    **
460 ! ************************
470 JSR PARAMETERS
480 JSR SAVWIN
490 JSR WINDOW
500 RTS
510 !
520 ! ************************
530 ! **    REPLACE WINDOW    **
540 ! ************************
550 JSR REPWIN
560 RTS
570 !
580 !
590 ! ************************
600 ! **   SCROLL WINDOW UP   **
610 ! ************************
620 JSR PARAMETERS
630 JSR UPSCROLL
640 RTS
650 !
660 ! ************************
670 ! **  SCROLL WINDOW DOWN  **
680 ! ************************
690 JSR PARAMETERS
700 JSR DOWNSCROLL
710 RTS
720 !
730 !
740 ! ************************
750 ! ** SCROLL WINDOW RIGHT  **
760 ! ************************
770 JSR PARAMETERS
780 JSR RTSCROLL
790 RTS
800 !
810 !
820 ! ************************
830 ! **  SCROLL WINDOW LEFT  **
840 ! ************************
850 JSR PARAMETERS
860 JSR LFTSCROLL
870 RTS
880 !
890 !
900 !
910 !
```

PROGRAM: 8.LISTING(DEMO)

```
100 REM-TEST PROGRAM
110 REM-FILL SCREEN
120 FORI=0TO999
130 J=J+1:IFJ=256THENJ=0
140 POKE1024+I,J:NEXT
150 GOSUB400
170 REM-REMOVE WINDOW
180 SYS49483
190 REM-MULTIPLE WINDOWS
200 SYS49473,1065,10,10,5
210 GOSUB500 :GOSUB400
220 SYS49473,1480,8,12,0
230 FORJ=0TO2:GOSUB500:SYS49483:NEXT
240 REM-SCROLL
250 GOSUB400
260 FORJ=0TO5:SYS49487,1150,28,15,7:NEXT
270 GOSUB500
280 FORJ=0TO3:SYS49508,1150,28,15,7:NEXT
290 GOSUB500
300 FORJ=0TO10:SYS49494,1150,28,15,7:NEXT
310 GOSUB500
320 FORJ=0TO3:SYS49501,1150,28,15,7:NEXT
330 GOSUB500
340 SYS49483
350 END
400 REM-DRAW WINDOW
410 SYS49473,1150,28,15,7
420 GOSUB500
430 REM-WRITE TO WINDOW
440 PRINTCHR$(19);:FORI=0TO10:PRINTCHR$(17);
    CHR$(29);:NEXT
450 PRINT"WINDOW DEMONSTRATION"
460 GOSUB500
470 RETURN
500 REM-WAIT
510 FORI=0TO2000:NEXT:RETURN
```

PROGRAM: WINDOW LOADER

This is a Basic loader for all of the scroll routines. you can use this instead of the assembler listings.

```
2D 10 BL=47    :LN=50    :SA=49424
5B 20 FOR L=0 TO BL:CX=0:FOR D=0 TO 15:READ A:CX=CX+A:POKE SA+L*16+D,A:NEXT D
A5 30 READ A:IF A><CX THENPRINT "ERROR IN LINE";LN+(L*10):STOP
40 40 NEXT L:END
0D 50 DATA 0,0,0,0,0,0,0,0,0,160,0,0,0,0,0,0,160
AF 60 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
24 70 DATA 0,0,0,0,0,0,0,0,73,66,75,67,32,67,85,66,531
3A 80 DATA 74,32,107,193,32,2,194,32,149,193,96,32,134,194,96,32,1592
87 90 DATA 107,193,32,41,195,96,32,107,193,32,68,195,96,32,107,193,1719
38 100 DATA 32,174,195,96,32,107,193,32,217,195,96,32,135,193,140,19,1888
1B 110 DATA 193,141,20,193,32,135,193,140,21,193,32,135,193,140,22,193,1976
3C 120 DATA 32,135,193,140,23,193,96,32,6,226,32,14,226,32,107,169,1656
06 130 DATA 165,21,164,20,96,172,21,193,200,162,0,32,174,193,232,32,1877
0B 140 DATA 174,193,240,5,202,202,76,159,193,232,32,174,193,96,32,247,2450
21 150 DATA 193,32,209,193,232,169,0,133,255,32,223,193,32,209,193,230,2528
40 160 DATA 255,165,255,205,22,193,144,241,232,32,223,193,32,209,193,136,2730
F2 170 DATA 96,32,235,193,189,56,193,145,251,173,23,193,145,253,96,24,2297
91 180 DATA 165,251,105,40,133,251,144,2,230,252,96,24,165,251,133,253,2495
D8 190 DATA 165,252,105,212,133,254,96,173,19,193,133,251,173,20,193,133,2505
05 200 DATA 252,96,174,18,193,224,10,240,73,189,24,193,133,253,173,19,2264
55 210 DATA 193,133,251,157,36,193,141,16,193,173,21,193,157,46,193,232,2328
78 220 DATA 189,24,193,133,254,173,20,193,133,252,157,36,193,141,17,193,2301
46 230 DATA 173,22,193,157,46,193,232,138,141,18,193,32,83,194,32,13,1860
84 240 DATA 195,32,83,194,174,18,193,165,253,157,24,193,232,165,254,157,2489
88 250 DATA 24,193,96,238,22,193,238,22,193,238,21,193,238,21,193,162,2285
3C 260 DATA 0,160,0,177,251,145,253,200,204,21,193,144,246,32,223,193,2442
D9 270 DATA 32,0,195,232,236,22,193,144,232,206,21,193,206,21,193,206,2332
9B 280 DATA 22,193,206,22,193,96,165,1,41,254,133,1,174,18,193,240,1952
B1 290 DATA 53,202,189,24,193,133,254,189,36,193,133,252,141,17,193,189,2391
C6 300 DATA 46,193,141,22,193,202,189,24,193,133,253,189,36,193,133,251,2391
96 310 DATA 141,16,193,189,46,193,141,21,193,138,141,18,193,32,205,194,2054
DD 320 DATA 32,13,195,32,205,194,165,1,9,1,133,1,96,238,22,193,1530
46 330 DATA 238,22,193,238,21,193,238,21,193,162,0,160,0,177,253,145,2254
46 340 DATA 251,200,204,21,193,144,246,32,223,193,32,0,195,232,236,22,2424
80 350 DATA 193,144,232,206,21,193,206,21,193,206,22,193,206,22,193,96,2347
E8 360 DATA 24,165,253,109,21,193,133,253,144,2,230,254,96,165,253,72,2367
CB 370 DATA 165,254,72,173,16,193,133,251,173,17,193,133,252,32,235,193,2485
6C 380 DATA 133,252,104,133,254,104,133,253,96,169,0,133,255,32,247,193,2491
2C 390 DATA 32,223,193,32,95,195,169,32,32,136,195,32,247,193,32,223,2061
3F 400 DATA 193,76,86,195,169,255,133,255,32,145,195,32,95,195,169,32,2257
35 410 DATA 32,136,195,32,145,195,32,235,193,133,252,32,95,195,96,174,2172
DA 420 DATA 22,193,202,172,21,193,165,251,133,253,165,252,133,254,165,255,2829
81 430 DATA 240,2,208,6,32,223,193,76,125,195,32,162,195,177,251,145,2262
B0 440 DATA 253,136,208,249,202,208,220,96,172,21,193,145,251,136,208,251,2949
1E 450 DATA 96,32,247,193,32,223,193,174,22,193,202,32,223,193,202,208,2465
C7 460 DATA 250,96,56,165,251,233,40,133,251,176,2,198,252,96,174,22,2395
12 470 DATA 193,32,247,193,32,223,193,32,235,193,172,21,193,136,177,251,2523
C9 480 DATA 200,145,251,136,177,253,200,145,253,136,136,208,241,200,169,32,2882
D6 490 DATA 145,251,32,223,193,202,208,223,96,174,22,193,32,247,193,32,2466
76 500 DATA 223,193,238,21,193,32,235,193,160,2,177,251,136,145,251,200,2650
37 510 DATA 177,253,136,145,253,200,200,204,21,193,208,238,136,169,32,145,2710
AE 520 DATA 251,32,223,193,202,208,222,206,21,193,0,0,0,0,0,0,1751
```

Listings

Get it right first time with our deluxe program system for the C64.

You may have noticed that our listings are free of those horrible little black blobs which send you searching around the keyboard for a suitable graphic symbol. You may also have noticed the funny numbers by the side of each line of the listing. Fret no more, it's all part of our easy entry aid.

Instead of those nasty graphics and rows of countless spaces in PRINT statements and strings we use a special coding system. The code, or mnemonic, is always contained in square brackets and you'll soon learn to decipher their meanings.

For example, [SA] would mean type in a Shifted A, or an ace of spades in layman's terms, and [SA10] would mean a row of ten of these symbols.

[S+2] means hold down the shift key and press the plus key twice. It doesn't take a great leap of logic to realise that [C+2] means exactly the same thing except that the Commodore key (bottom left of the keyboard) is held down instead of the shift key.

If more than two spaces appear in a statement then this will be printed as [SPC4] or, exceptionally, [SSPC4]. Translated into English this means press the spacebar four times or in the latter case hold the shift key down while you do it.

A string of special characters could appear as:

[CTRL N, DOWN2,LEFT5,BLUE, F3,C3]

This would be achieved by holding down the CTRL key as you press N, press the cursor key down twice, the cursor left key five times, press the key marked BLUE while holding down the CTRL key, press the F3 key and, finally hold the Commodore key down while pressing the number two key (C2 would of course make the computer print in brown).

Always remember that you should only have a row of graphics characters on your screen with no square brackets and no commas, unless something like this appears:

[SS],[C*]

In this case the two characters should have a comma between them.

On rare occasions [REV T] will appear in a listing. This is a delete symbol and is created by entering the line up to this mnemonic. Then type a closing quotation mark (SHIFT & 2) and delete it. This gets the computer out of quotes mode. Hold down CTRL and press the number nine key (RVSON), type the relevant number of reversed T's and then hold down CTRL and press zero (RVSOFF). Next type another quotation mark and delete it again. Now finish the line and press RETURN.

A list of these special cases is given in the table but remember that only one of these mnemonics will appear outside of a PRINT string: the symbol for pi. This may appear when its value is needed in a calculation so this may look something like:

:CC=2*[PI]*R:

Ignore the square brackets and just type in a shifted upward pointing arrow (ie. the pi symbol).

```
PROGRAM: SYNTAX CHECKER

 5 REM SYTAX CHECKER - ERIC DOYLE

 10 BL=10   :LN=70   :SA=49152
 20 FOR L=0 TO BL:CX=0:FOR D=0 TO
  15
 30 READ A:IF A>255THENPRINT"NUMB
 ER TO LARGE";LN+(L*10):STOP
 40 CX=CX+A:POKE SA+L*16+D,A:NEXT
  D
 50 READ A:IF A><CX THENPRINT"ERR
 OR IN LINE";LN+(L*10):STOP
 60 NEXT L:SYS 49152:NEW
 70 DATA 173,5,3,201,165,208,31,1
 20,169,9,141,32,208,141,33,208,1
 847
 80 DATA 169,7,141,134,2,169,13,3
 2,210,255,169,64,141,4,3,169,168
 2
 90 DATA 192,141,5,3,88,96,120,16
 9,124,141,4,3,169,165,141,5,1566

 100 DATA 3,169,14,141,134,2,141,
 32,208,169,6,141,33,208,88,96,15
 85
 110 DATA 32,124,165,72,138,72,15
 2,72,162,0,165,20,133,254,165,21
 ,1747
 120 DATA 24,101,254,133,254,189,
 0,2,240,18,69,254,133,254,232,18
 9,2346
 130 DATA 0,2,240,8,24,101,254,13
 3,254,232,208,233,169,1,141,134,
 2134
 140 DATA 2,165,254,74,74,74,74,3
 2,156,192,32,210,255,165,254,41,
 2054
 150 DATA 15,32,156,192,32,210,25
 5,169,13,32,210,255,169,13,32,21
 0,1995
 160 DATA 255,169,7,141,134,2,104
 ,168,104,170,104,96,24,105,48,20
 1,1832
 170 DATA 58,16,1,96,24,105,7,96,
 0,0,0,0,0,0,0,0,403
```

by Eric Doyle

Checksum Program

The hexadecimal numbers appearing in a column to the left of the listing should not be typed in with the program. These are merely checksum values and are there to help you get each line right. Don't worry if you don't understand the hexadecimal system, as long as you can compare two characters on the screen with the corresponding two characters in the magazine you can use our line checking program.

Type in the Checksum Program, make sure that you've not made any mistakes and save it to tape or disk immediately because it will be used with most of the present and future listings appearing in Your Commodore.

At the start of each programming session, load Checksum and run it. The screen will turn brown with yellow characters and each time you type in a line and press the RETURN key a number will appear on the screen in white. This should be the same as the corresponding value in the magazine.

If the two values don't relate to one another, you have not copied the line exactly as printed so go back and check each character carefully. When you find the error simply correct it and press RETURN again.

If you want to turn off the checker simply type SYS49152 and the screen will return to the familiar blue colours. You can then do whatever it was you wanted to do and if this doesn't use the area where Checksum lies you can go back to it with the same SYS command.

No system is foolproof but the chances of two errors cancelling one another out are so remote that we believe our listings are more reliable than any other magazine in the world. So get typing!

YC

Mnemonic	Symbol	Keypress
[RIGHT]		CRSR left/right
[LEFT]		SHIFT & CRSR left/right
[DOWN]		CRSR up/down
[UP]		SHIFT & CRSR up/down
[F1]		f1 key
[F2]		SHIFT & f1 key
[F3]		f3 key
[F4]		SHIFT & f3 key
[F5]		f5 key
[F6]		SHIFT & f5 key
[F7]		f7 key
[F8]		SHIFT & f7 key
[HOME]		CLR/HOME
[CLR]		SHIFT & CLR/HOME
[RVSON]		CTRL & 9
[RVSOFF]		CTRL & 0

Mnemonic	Symbol	Keypress
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8
[POUND]		£
[LARROW]		←
[UPARROW]		↑
[PI]		SHIFT & ↑
[INST]		SHIFT & INST/DEL
[REV T]		see text
[Cletter]		CBM + letter
[Sletter]		SHIFT + letter

Software for sale

If you think that one of our programs looks very interesting, but you can't afford the time to type it in then our software service will help you out.

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Everyone has probably faced this problem. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how lo ng you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

The *Your Commodore* Software Service makes available all of the programs from each issue on both cassette and disk at a price of £6.00 for disk and £4.00 for cassette. None of the documentation for the programs is supplied with the software since it is all available in the relevant magazine. Should you not have the magazine then back issues are available from the following address:

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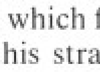
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The Disk

Programs on the disk will also be supplied as totally working versions, i.e. when possible we will not use Basic Loaders thus making use of the programs much easier. Unfortunately at the moment we cannot duplicate C16 and Plus/4 cassettes. However programs for these machines will be available on the disk.

What programs are available?

At the top of each article you will find a strap containing the article type, C64 Program etc. So that you can see which programs are available on which format you will also find a couple of symbols after this strap. The symbols have the following meaning:



This symbol means that the program is available on cassette.



These programs are available on disk.

Please Note

Since the programs supplied on cassette are total working versions of the program, we do not put disk only programs on tape. There is no sense in placing a program that expects to be reading from disk on to tape.

MARCH 1987

SPELLING CHECKER — for use with the Plus/4 word processor — disk only.
NINE LINE MATRIX — Clearer 80 column displays on your C128.
JOYSTICK READ — Invaluable joystick routine for Basic programmers with a C64.
LABELLER 64 — See February 1987.
HEX DATA ENTRY — Our machine code easy entry program for C64.
WIMPS AND MUCH MORE — An extension to our C64 Wimps program plus a foolproof INPUT system.
DISKIT — Memory Saver, Program Compressor and One Part Maker. The first three parts of this popular series for C64 and disk (Disk only).
NURSERY RHYME LAND — See February 1987.
POPPER — A game featuring Popper the green pea, for the C64.
Order codes
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TAPE YCMAR 87 £4.00

APRIL 1987

CRIBBAGE - A computerised version of this popular card game. Plus/4, disk only.
DISKIT 4 - A protection program to look after your C64 programs. (Disk only).
DISKIT 5 - A machine code to DATA statement convertor for C64. (Disk only).
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MAY 1987

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EVERYMAN'S GUIDE TO GRAPHICS – All of the programs from this fascinating article.
C64 SPRITE EDITOR – A comprehensive sprite editor for the C64. Available for both disk and tape.
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JUNE 1987

DUAL PROGRAMMING – Have two programs in your Plus/4's memory at once. (On disk only).
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SMART LISTER – Make your listings smarter and neater with this program. (C64).
PROCEDURES – Easier programming for the C64 with this program.
C64 SOURCE GENERATOR – A powerful disassembler for the C64.
LIST ENHANCER – Improve the LIST command of your C64.
ANALYSER – A machine code debugger for the C128.

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JULY 1987

UTILITY COMMANDS — This provides many vital commands missing from Basic 7.0 on the 128.
PLUS/4 AND C64 CRUNCHER — Speed up your programs with these handy utilities.
PROGRAMMABLE FUNCTION KEYS — A utility to make more use of the function keys on the C64.
DISKIT 5 — A handy routine to convert memory to data statements on the C64. (Disk only).
ARCADE ACTION — Get those sprites with these handy arcade routines on the C64.
CROSS REFERENCE — This program helps you sort out your variables on the C64.
SUICIDE RUN — A fast and stimulating game for the C64.

ORDER CODE
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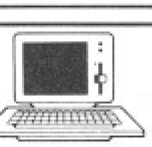
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SOFTWARE

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Should any of the above be missing then we will not be able to deal with your query.

We will try to point out where you have made errors and place a corrected copy of the program back on to your tape or disk before we return it to you.

Do not send a program to us as soon as it stops working, please check it several times first.

We do get a large number of queries and so it may take a while for us to deal with yours personally.
Note: we can only deal with problems relating to programs published in *Your Commodore*.



Before all you C64 addicts rush to Martech to playtest their fast and furious new game, Mega-Apocalypse, remember where you first read about it — in this month's *Your Commodore* news pages of course. The awe-struck individual above is the game's programmer, Simon Nichol, who has been working on the game since 1985 — and its beginning to show! Put pen to paper and we will give away a fiver to the best caption for Simon's reaction.

Send your caption to *Your Commodore*, Mega-Apocalypse Competition, 1 Golden Square London W1R 3AB.

Entries must reach our office by Friday 28th August 1987.

At the *Your Commodore* office we receive hundreds of letters from readers every month. We do try and answer each individually but sometimes this is impossible due to pressure of work. If you have written to us and not received a personal reply, we apologise for this but we cannot promise to reply to every item of mail we receive. If you feel that your question or letter really needs an answer, then inclusion of an s.a.e. will guarantee a reply, although this may still take time to arrive.

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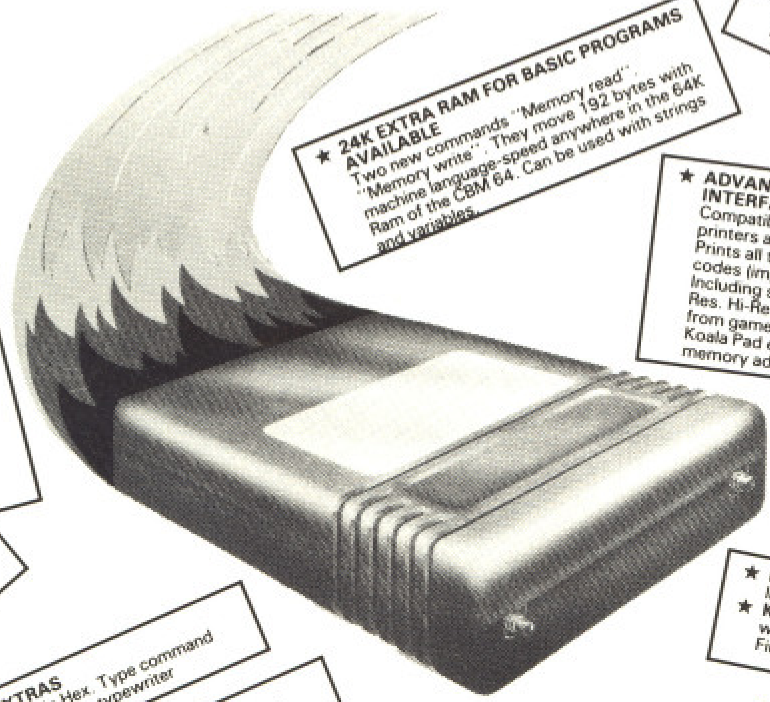
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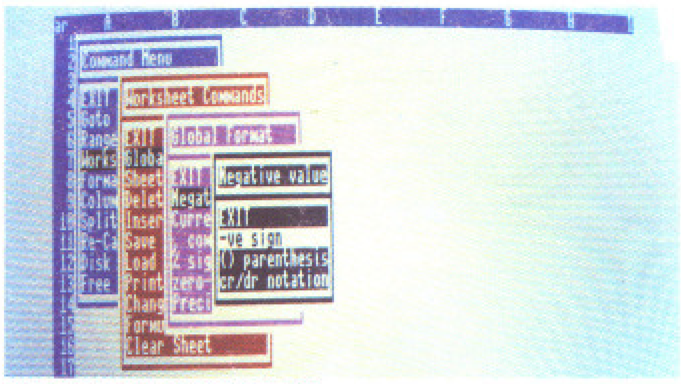
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